RAJALAKSHMI ENGINEERING COLLEGE

An AUTONOMOUS Institution

Affiliated to ANNA UNIVERSITY, Chennai

DEPARTMENT OF COMPUTER SCIENCE AND DESIGN

REGULATION 2023

CURRICULAM AND SYLLABUS

for

B.E. Computer Science and Design

(Choice Based Credit System)

NAAC A++ Accredited

RAJALAKSHMI ENGINEERING COLLEGE
An AUTONOMOUS Institution
Affiliated to ANNA UNIVERSITY, Chennai
Estd. 1996

Department of Computer Science and Engineering

Minutes of 19th BoS Meeting held on 3rd January, 2025 at 10.00 a.m.
(Common to CSE, CSBS, AI and ML, CSD, AI and DS, Cyber Security)

Google Meet Link: https://meet.google.com/vsm-yaxm-qad

Members of the Board of Studies:

S.No.	Members Name	Designation	Position in the BOS
1.	Dr. P. Kumar	Professor and Head, CSE & Director-Computing and Information Science, Rajalakshmi Engg College	Chairman
2.	Dr. V. Kavitha	Professor and Dean, Dept of CSE, University College of Engineering, Kancheepuram Campus, Kancheepuram	Anna University Nominee
3.	Dr. R. Jagadeesh Kannan	Professor & Dean (Engg & Tech) SRM Institute of Science and Technology, Tiruchirappalli	Outside Expert
4.	Mr. Asoke Das Sarma	Head-Transformation, Cognitive Business Operations, Tata Consultancy Services	Industry Expert (CSBS)
5.	Mr. K. Ramakrishnan	Consultant, EduTech Space, Chennai	Industry Expert
6.	Mr. Kirubhakar Thangaraj	Founding Member, Conektto Inc., US	Distinguished Alumni
7.	Dr. K. Devaki	Professor and Head, CSBS, REC	Member
8.	Dr. K. Sekar	Professor and Head, AIML, REC	Member
9.	Mr. S. Umamahewar Rao	AOP and Head, CSD, REC	Member
10.	Mr. Benedict JN	AP(SG) and Head, CSE (Cyber Security)	Member
11.	Dr. J.M. Gnanasekar	Professor and Head, AIDS, REC	Member
12.	Dr. S. Poonkuzhali	Professor, Director – Alumni Affairs, AIML, REC	Member
13.	Dr. S. Vinodkumar	Professor, CSE, REC	Member
14.	Dr. P. Revathy	Professor, CSD, REC	Member
15.	Dr. P. Indira Priya	Professor, AIDS, REC	Member
16.	Dr. P. Tamilselvi	Professor, CSBS, REC	Member

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Agenda for 19th Board of Studies

S.No	Item
1.	Seeking BoS approval for additional Elective courses in B.E. CSE for Regulations 2019
2.	Seeking BoS approval for B.E. CSD Syllabi(V to VIII Semesters) and Professional Electives for Regulations 2023
3.	Seeking BoS approval for B.Tech AI and ML Syllabi (V to VIII Semesters) and Professional Electives for Regulations 2023
4.	Seeking BoS approval for B.Tech AI and DS Syllabi (V to VIII Semesters) and Professional Electives for Regulations 2023
5.	Seeking BoS approval for B.Tech CSBS Syllabi (V to VIII Semesters) and Professional Electives for Regulations 2023
6.	AOB with the permission of the Chair.

The chairman welcomed all the members to the 19th meeting of the Board of Studies and briefed them about the agenda. The details of discussion on the agenda points are as follows.

1. **Seeking BoS approval for additional Elective courses in B.E. CSE for Regulations 2019.**

CS19P23 - Advanced Application Development with Oracle APEX
CS19P24 - Introduction to Modern Databases with MongoDB
CS19P25 - Immersive Experience in AR/VR
CS19P26 - IoT: Concepts and Hands-On Applications
CS19P27 - Data Analytics and Insights in MindSphere

CS23B32 - Advanced Application Development with Oracle APEX
CS23B33 - Introduction to Modern Databases with MongoDB
CS23B34 - Immersive Experience in AR/VR
CS23B35 - IoT: Concepts and Hands-On Applications
CS23C31 - Data Analytics and Insights in MindSphere

The Chairman discussed the syllabus of additional Elective courses in B.E. CSE for R2019 and R2023 with the members of BoS.

Dr. Kavitha suggested to add latest textbook for the subjects. The chairman said it can be added in the lab syllabus. Also suggested to provide the CO-PO mapping for the courses CS19P23 and CS19P24.

The BoS Members unanimously resolved to approve the Elective courses.

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2. Seeking BoS approval for B.E. CSD Syllabi (V to VIII Semesters) and Professional Electives for Regulations 2023

Mr. S. Umamahewar Rao presented the syllabus for R2023 5th to 8th Semester and Professional Electives for B.E. CSD

Dr. V. Kavitha suggested to change the title of CD23A32 – Fundamentals Augmented Reality to Fundamentals of Augmented Reality.

Mr. Kirubhakar Thangaraj suggested to include FFmpeg in the subject CD23B31 – Digital Audio and Design Synthesis, so that syllabus will be at the latest trend.

Mr. K. Ramakrishnan suggested to add Large Language Model as an Elective course in Data Science Vertical for all the courses. The syllabus can be framed with Generative AI and Prompt Engineering. The chairman said it can be added in the Electives.

The BoS Members unanimously resolved to approve the R2023 3rd to 8th semester syllabus and Professional Electives of all the courses of B.E (CSD).

3. Seeking BoS approval for B.Tech AI and ML Syllabi (V to VIII Semesters) and Professional Electives for Regulations 2023

Dr. K. Sekar presented the syllabus for R2023 5th to 8th Semester and Professional Electives for B.Tech AI and ML.

Mr. K. Ramakrishnan suggested to include a course on Data Engineering with the following topics: Data Migration - Cloud Migration - Apache Spark, Hadoop Spark. He also suggested to include RAG and use OpenSourceAI for the subject AI23A32: Large Language Model

Mr. Kirubhakar Thangaraj suggested to add more real life use cases (Like ResNet) in AI23531: Deep Learning course.

Also in AI23521: Build and Deploy Machine Learning Applications course, Experiment 8 is huge and asked to split and make into 8,9,10 (or Make it as mini Project). He suggested to Introduce Deployment Technology for deploying application (or) Change the subject name to "Build and Package Machine Learning Applications".

Dr. V. Kavitha suggested to include experiments to work with TAMIL language in AI23632: Natural Language Processing. Also suggested to include experiments for extracting data from e-mail.

The BoS Members unanimously resolved to approve the R2023 3rd to 8th semester syllabus and Professional Electives of all the courses of B.Tech AI and ML.

4. Seeking BoS approval for B.Tech AI and DS Syllabi (V to VIII Semesters) and Professional Electives for Regulations 2023

Dr. P. Indira Priya presented the syllabus for R2023 5th to 8th Semester and Professional Electives for B.Tech AI and DS.

Dr. V. Kavitha suggested to rename the subject AD23532 – Foundations of Data Science as Principles of Data Science. She also suggested to modify Unit V with Data Science Ethics.

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Mr. Kirubhakar Thangaraj suggested to review experiments 6, 7, 8 to avoid the similarity in the subject AD23A31-Customer Analytics and Opinion Mining.
Mr. K. Ramakrishnan suggested to include a course on Data Engineering with the following topics: Data Migration - Cloud Migration - Apache Spark, Hadoop Spark. in any one semester.
The BoS Members unanimously resolved to approve the R2023 3rd to 8th semester syllabus and Professional Electives of all the courses of B.Tech AI and DS.

5. Seeking BoS approval for B.Tech CSBS Syllabi (V to VIII Semesters) and Professional Electives for Regulations 2023

Dr. K. Devaki presented the syllabus for R2023 5th to 8th Semester and Professional Electives for B. Tech (CSBS) under R2023.
Mr. Kirubhakar Thangaraj suggested to remove Devops from Unit-V and include the agile software development methodologies, Extreme Programming (XP) / Kanban in CB23732- IT Project Management subject. He also suggested to include lab exercises for the Subject CB23A11 - Enterprise Resource Planning in professional electives and also to include latest edition of books in Text and Reference books section.
Dr. V. Kavitha suggested to reframe the sentences in list of experiments section for the subject CB23C31 - Image Processing and Pattern Recognition in professional electives.
Mr. K. Ramakrishnan suggested to have one functional and one scripting Language (PHP/Angular) in Unit- 1, for the subject CB23E35 - Enterprise Systems in professional electives. He also suggested to rename the subject "CB23F32 -Advanced Scripting Language" in professional electives as "Scripting Languages". It is also suggested to remove PERL from Unit-5 and to include Shell Script in that place.

6. AOB with the permission of the Chair.
Mr. K. Ramakrishnan suggested to have a course on Generative AI and Prompt Engineering for B.E. CSE. He emphasized that this will empower students to harness AI models effectively for innovative problem-solving and transforming core areas like programming, automation, and intelligent systems. Mr. Kirubhakar Thangaraj suggested to have it in the core course and asked to move the BA23512 Fundamentals of Accounting to Professional Elective course which has limited relevance to their technical and career-focused growth.

The BoS Members unanimously resolved to approve the R2023 3rd to 8th semester syllabus and Professional Electives of all the courses of B. Tech CSBS, AI and ML, CSD, AI and DS.
The chairman thanked the BoS members for their suggestions on curriculum and syllabus towards the R2023 and R2019 Syllabus for various undergraduate degree programmes like CSE, AI and ML, AI and DS, CSBS, Cyber Security and CSD.

HoD / CSE

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25 years OF ACADEMIC EXCELLENCE

Department of Computer Science and Engineering

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(Common to CSE, CSBS, AI and ML, CSD, AIDS, Cyber Security)

Google Meet Link: https://meet.google.com/vsm-yaxm-qad

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2.	Dr. V. Kavitha	Professor and Dean, Dept of CSE, University College of Engineering, Kancheepuram Campus, Kancheepuram	Anna University Nominee	3/1/2025
3.	Dr. R. Jagadeesh Kannan	Professor & Dean (Engg & Tech) SRM Institute of Science and Technology, Tiruchirappalli	Outside Expert	online
4.	Mr. Asoke Das Sarma	Head-Transformation, Cognitive Business Operations, Tata Consultancy Services	Industry Expert (CSBS)	online
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RAJALAKSHMI ENGINEERING COLLEGE
CURRICULUM AND SYLLABUS

B.E. COMPUTER SCIENCE AND DESIGN
REGULATIONS 2023

Vision

To develop Innovative and highly Ethical Computer Science and Design Professionals through excellence in teaching, research and training.

Mission

- To produce globally competent professionals, motivated to learn the emerging technologies in Computer Science and Design and to be creative and innovative in solving real world problems.
- To promote research activities amongst the faculty and students that could benefit the society.
- To impart ethical values in their profession.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO 1: To equip students with essential background in computer science and design, and applied mathematics by adopting best practices to meet the demands of academia, industry and media.

PEO 2: To prepare students with fundamental knowledge in programming languages, and tools and enable them to improve and develop applications.

PEO 3: To develop professionally ethical and socially responsible computer science and design professionals with enhanced analytical skills, communication skills, lifelong learning, creativity, innovation, organizing ability and leadership quality to meet industry requirements.

PROGRAMME OUTCOMES (POs)

PO1: Engineering knowledge: Apply the knowledge of Mathematics, Science, Engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO 4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

A graduate of the Computer Science and Design Program will have

PSO 1: Strength in the foundations of programming languages and competence in computing technologies and tools to design and implement efficient software solutions using suitable algorithms, data structures and other computing techniques.

PSO 2: A Skill to Independently investigate problems which can be solved by a Human Computer Interaction (HCI) design process and design an end-to-end solution from user need identification to UI design to technical coding and evaluation. Ability to effectively use suitable tools and platforms, as well as enhance them, to design and develop applications/products in animation, gaming, augmented and virtual reality, etc.

PSO 3: An Ability to apply knowledge in various domains to identify research gaps and to provide solution to new ideas, inculcate passion towards higher studies, creating innovative career paths to be an entrepreneur and evolve as an ethically social responsible computer science and design professional.

CURRICULUM

B. E. COMPUTER SCIENCE AND DESIGN

Regulation 2023 | Total Credits: 160

SEMESTER I								
SI. NO.	**COURSE CODE**	**COURSE TITLE**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY COURSES								
1.	HS23111	Technical Communication I	HS	2	2	0	0	2
2.	MA23113	Mathematics for Design	BS	4	3	1	0	4
3.	CD23111	Design Drawing and Sketching	PC	3	2	1	0	3
4.	GE23117	தமிழ்மரபு /Heritage of Tamils	HS	1	1	0	0	1
LAB ORIENTED THEORY COURSES								
5.	GE23131	Programming using C	ES	7	1	0	6	4
6.	PH23132	Physics for Information Science	BS	5	3	0	2	4
LABORATORY COURSE								
7.	GE23122	Engineering Practices – Electrical and Electronics	ES	2	0	0	2	1
MANDATORY COURSE								
8.	MC23111	Indian Constitution and Freedom Movement	MC	3	3	0	0	0
			TOTAL	**27**	**15**	**2**	**10**	**19**

SEMESTER II								
SI. NO.	**COURSE CODE**	**COURSE TITLE**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY COURSES								
1.	MA23214	Probability and Inferential Statistics	BS	4	3	1	0	4
2.	CD23211	Foundation in Digital Storytelling	PC	3	3	0	0	3
3.	GE23217	தமிழர்களும் தொழில்நுட்பமும் / Tamils and Technology	HS	1	1	0	0	1
LAB ORIENTED THEORY COURSES								
4.	CD23231	Visual Communication Foundations	PC	6	2	0	4	4
5.	IT23231	Digital Principles and Computer Architecture	PC	5	3	0	2	4
6.	CS23231	Data Structures	PC	7	3	0	4	5

LABORATORY COURSE								
7.	HS23221/HS 23222	Technical Communication II / English for Professional Competence	HS	2	0	0	2	1
8.	GE23121	Engineering Practices – Civil and Mechanical	ES	2	0	0	2	1
MANDATORY COURSE								
9.	MC23112	Environmental Science and Engineering	MC	3	3	0	0	0
			TOTAL	**33**	**18**	**1**	**14**	**23**

SEMESTER III								
SI. NO.	**COURSE CODE**	**COURSE TITLE**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY COURSES								
1.	MA23313	Discrete Mathematics for AI	BS	4	3	1	0	4
LAB ORIENTED THEORY COURSES								
2.	CD23331	Design Processes and Perspectives	PC	5	3	0	2	4
3.	CS23331	Design and Analysis of Algorithms	PC	5	3	0	2	4
4.	CD23332	UI and UX design	PC	6	2	0	4	4
5.	CS23332	Database Management Systems	PC	7	3	0	4	5
LABORATORY COURSE								
6.	CD23321	Python Programming for Design	PC	6	0	0	6	3
TOTAL				**33**	**14**	**1**	**18**	**24**

SEMESTER IV								
SI. NO.	**COURSE CODE**	**COURSE TITLE**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY COURSES								
1.		Open Elective-I	OE	3	3	0	0	3
LAB ORIENTED THEORY COURSES								
2.	MA23433	Mathematical Modelling and Simulation	BS	5	3	0	2	4
3.	AI23231	Principles of Artificial Intelligence	PC	5	3	0	2	4
4.	CS23432	Software Construction	PC	5	3	0	2	4
5.	CS23532	Computer Networks	PC	5	3	0	2	4
6.	CS23333	Object Oriented Programming using Java	PC	7	1	0	6	4
EMPLOYABILITY ENHANCEMENT COURSES								

7.	GE23421	Soft Skills – I	EEC	2	0	0	2	1
8.	CD23421	Industry Internship (2/4 weeks)	EEC	0	0	0	0	1
			TOTAL	**32**	**16**	**0**	**16**	**25**

SEMESTER V								
SI. NO.	**COURSE CODE**	**COURSE TITLE**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY COURSES								
1.		Professional Elective-I	PE	3	3	0	0	3
LAB ORIENTED THEORY COURSES								
2.	CD23531	3D Modelling and Texturing	PC	4	2	0	2	3
3.	CS23431	Operating Systems	PC	7	3	0	4	5
4.	CS23531	Web Programming	PC	7	1	0	6	4
5.	GE23627	Design Thinking for Innovation	EEC	4	0	0	4	2
6.	IT23E31	Graphics and Multimedia	PE	4	2	0	2	3
EMPLOYABILITY ENHANCEMENT COURSES								
7.	GE23521	Soft Skills – II	EEC	2	0	0	2	1
			TOTAL	**26**	**10**	**0**	**16**	**21**

SEMESTER VI								
SI. NO.	**COURSE CODE**	**COURSE TITLE**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY COURSES								
1.		Open Elective – II	OE	3	3	0	0	3
LAB ORIENTED THEORY COURSES								
2.		Professional Elective-II	PE	5	3	0	2	3
3.	CD23631	Game Design and Development	PC	6	2	0	4	4
4.	AI23331	Fundamentals of Machine Learning	PC	5	3	0	2	4
5.	CD23632	3D Rigging and Animation	EEC	6	2	0	4	4
LABORATORY COURSES								
6.	CD23621	Mobile Application Design and Development Laboratory	PC	4	0	0	4	2
EMPLOYABILITY ENHANCEMENT COURSES								
7.	GE23622	Problem Solving Techniques	EEC	2	0	0	2	1
TOTAL				**31**	**13**	**0**	**18**	**21**

SEMESTER VII								
SI. NO.	**COURSE CODE**	**COURSE TITLE**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY COURSES								
1.		Professional Elective-III	PE	3	3	0	0	3
LAB ORIENTED THEORY COURSES								
2.		Professional Elective-IV	PE	4	2	0	4	3
3.	CD23731	Film Making and Radio Podcasting	PC	4	2	0	2	3
LABORATORY COURSES								
4.	CD23721	Visual Effects	PC	6	0	0	6	3
5.	CD23722	Capstone Project Phase 1*	EEC	8	0	0	8	4
			TOTAL	**26**	**8**	**0**	**18**	**16**

SEMESTER VIII								
SI. NO.	**COURSE CODE**	**COURSE TITLE**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
1.		Professional Elective-V	PE	3	3	0	0	3
2.		Professional Elective-VI	PE	3	3	0	0	3
LABORATORY COURSES								
3.	CD23821	Capstone Project Phase 2*	EEC	12	0	0	12	6
TOTAL				**18**	**6**	**0**	**12**	**12**

***Should have focus on Design Aspects**

TOTAL NO. OF CREDITS: 161

PROFESSIONAL ELECTIVES (PE)

Emerging Technologies								
SI. NO.	**COURSE CODE**	**COURSE TITLE**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
1	CS23A32	Robotic Process Automation	PE	5	1	0	4	3
2	MCB2302	Digital Marketing and Web Analytics	PE	3	3	0	0	3
3	CS23A36	3D Printing and Design	PE	4	2	0	2	3
4	IT23A31	Internet of Things	PE	4	3	0	0	3
5	CS23A33	Cyber security and Forensics	PE	4	2	0	2	3
6	CS23632	Cryptography and Network Security	PE	4	2	0	2	3
7	AI23B36	Cognitive Science	PE	4	3	0	0	3
8	AI23P39	Soft Computing	PE	4	2	0	2	3

Full Stack Development								
SI. NO.	**COURSE CODE**	**COURSE TITLE**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
1	IT23C31	Software Testing	PE	3	2	0	2	3
2	IT23B32	Advanced Web Programming	PE	4	1	0	4	3
3	IT23B33	DevOps	PE	4	2	0	2	3
4	IT23B34	Advanced Java Programming	PE	4	3	0	0	3
5	IT23C12	Software Project Management	PE	3	3	0	0	3
6	IT23C18	Agile Methodologies	PE	3	3	0	0	3

Cyber Security								
SI. NO.	**COURSE CODE**	**COURSE TITLE**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
1.	CR23A11	Security Assessment and Risk Analysis	PE	3	3	0	0	3
2.	CS23A11	Malware Detection and Analysis	PE	3	3	0	0	3
3.	CR23A31	Ethical Hacking and Security	PE	4	2	0	2	3
4.	CR23A32	Digital and Mobile Forensics	PE	4	2	0	2	3
5	CR23A34	Security and Privacy in Cloud	PE	4	2	0	2	3
6	CR23A35	Social Network Security	PE	4	2	0	2	3
7	CS23A35	Web Application Security	PE	4	2	0	2	3
8	CR23A36	Information Security and Management	PE	4	2	0	2	3

FROM CSD

Elective Courses offered by CSD

Open Electives								
SL.NO	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**CONTACT PERIOD**	**L**	**T**	**P**	**C**
1.	CD23O31	3D MAYA	PC	4	2	0	2	3
2.	CD23O32	UI /UX	PC	4	2	0	2	3

Group-1(PE-3 CREDITS)

ANALYTICS,VIRTUAL AND AUGMENTED REALITY								
SL. NO	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**CONTACT PERIOD**	**L**	**T**	**P**	**C**
1	CD23A32	Fundamentals Of Augmented Reality	PE	6	2	0	2	3
2	CD23A33	Fundamentals Of Virtual Reality	PE	6	2	0	2	3
3	CD23A35	Digital Video Production	PE	6	2	0	2	3
4	CS23B31	Introduction to Metaverse			2	0	2	3
5	CD23A31	Introduction To Motion Graphics	PE	6	2	0	2	3
6	CD23C32	Data Visualization	PE	5	0	0	6	3
7	AI23A36	Big Data Analytics	PE	6	2	0	2	3

Group-2(PE-3 CREDITS)

Digital Media Management

SI. NO.	**COURSE CODE**	**COURSE TITLE**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
1	CD23B11	Aesthetics And Art	PE	4	3	0	0	3
2	CD23B12	Digital Media Entrepreneurship	PE	3	3	0	0	3
3	CD23B13	Interactive Marketing Fundamentals	PE	3	3	0	0	3
4	CD23B31	Digital Audio Design And Synthesis	PE	4	2	0	2	3
5	CD23B32	Design Digital Advertising	PE	4	2	0	2	3
6	IT23B31	C# AND .NET PROGRAMMING	PE	4	2	0	2	3

Subject Code	Subject Name (Theory course)	Category	L	T	P	C
HS23111	Technical Communication I	HS	2	0	0	2
Common to all branches of B.E/B. Tech programmes – First Semester						

Objectives:
To facilitate students develop their comprehension skills
To enable students to improve their receptive skills
To equip learners with better vocabulary and enhance their writing skills
To aid students speak effectively in all kinds of communicative contexts.
To improve the learners' basic proficiency in workplace communication

UNIT-I	DEVELOPING COMPREHENSION SKILLS	6

Listening: Introduction to Informational listening – Listening to Podcasts, News

Reading: Intentional Reading - Short Narratives and Passages.

Speaking: Introducing Oneself, Narrating a Story / Incident.

Writing: Sequential Writing – connecting ideas using transitional words (Jumbled Sentences), Process Description **Grammar:** Verbs –Main& Auxiliary: Simple Tenses – Form, Function and Meaning.

Vocabulary: Word formation – Prefix, Suffix, Compound Words.

UNIT-II	LISTENING AND EXTENDED READING	6

Listening: Deep Listening – Listening to Talk Shows and Debates

Reading: In-depth Reading - Scanning Passages

Speaking: Describing Current Issues, Happenings, etc..,

Writing: Note Making, Note Taking – Paragraph Writing

Grammar: Continuous Tenses, Prepositions, Articles

Vocabulary:One Word Substitutes, Phrasal Verbs.

UNIT-III	FORMAL WRITING AND VERBAL ABILITY	6
Listening: Listening to Lectures and Taking Notes **Reading:** Interpretation of Tables, Charts and Graphs **Speaking:**SWOT Analysis on Oneself **Writing:**Formal Letter Writing and Email Writing **Grammar:**Perfect Tenses, Phrases and Clauses, Discourse Markers **Vocabulary :**Verbal Analogy / Cloze Exercise		
UNIT-IV	**ENHANCING SPEAKING ABILITY**	6
Listening: Listening to eminent voices of one's interest (Martin Luther King, APJ Abdul Kalam, etc..) **Reading:**Timed Reading, Filling KWL Chart. **Speaking:**Just a Minute, Impromptu **Writing:**Check-list, Instructions. **Grammar:**'Wh'Questions / 'Yes' or 'No'Questions, Imperatives **Vocabulary:**Synonyms, Antonyms, Different forms of the same words.		
UNIT-V	**LANGUAGE FOR WORKPLACE**	6
Listening: Extensive Listening (Audiobooks, rendering of poems, etc.) **Reading**: Extensive reading (Jigsaw Reading, Short Stories, Novels) **Speaking**: Short Presentationson Technical Topics **Writing:**Recommendations,Essay Writing **Grammar:**Impersonal Passive, Reported Speech,Concord **Vocabulary :**Informal Vocabulary and Formal Substitutes		
Total Contact Hours: 30		

Course Outcomes:
On completion of the course students will be able to
apply their comprehension skills and interpret different contents effortlessly
read and comprehend various texts and audio visual contents
infer data from graphs and charts and communicate it efficiently in varied contexts
participate effectively in diverse speaking situations
to present, discuss and coordinate with their peers in workplace using their language skills

SUGGESTED ACTIVITIES

- Ice breaker
- Just A Minute
- Ship wreck
- Hot seat
- Vocabulary building
- Chinese whispers
- Case study

SUGGESTED EVALUATION METHODS

Assignment topics
Quizzes
Class Presentation/Discussion
Continuous Assessment Tests

Text Book(s):
1. Effective Technical Communication by M. Ashraf Rizvi (Author) 2nd Edition Paperback 2017
2. Sylvan Barnet and Hugo Bedau, 'Critical Thinking Reading and Writing', Bedford/st. Martin's: Fifth Edition (June 28, 2004)
3. Meenakshi Upadhyay, Arun Sharma – Verbal Ability and Reading Comprehension.
4. Teaching Speaking: A Holistic Approach, Book by Anne Burns and Christine ChuenMengGoh, Cambridge University Press

Reference Books(s) / Web links:
1. Basic Vocabulary in Use: 60 Units of Vocabulary Practice in North American English With Answers 2nd Edition by Michael McCarthy (Author), Felicity O'Dell (Author), John D. Bunting (Contributor)
2. Reading Development and Difficulties By Kate Cain
3. The 7 Habits of Highly Effective People by Stephen Covey, Simon and Schuster, UK
4. Everybody Writes: Your Go-To Guide to Creating Ridiculously Good Content Hardcover by Ann Handley (Author)

Course Code	Course Title	Category	L	T	P	C
MA23113	MATHEMATICS FOR DESIGN	BS	3	1	0	4

Objectives:
● To express various matrix techniques and to illustrate the nature of the matrix.
● To gather the matrix algebra techniques and the concepts of basis and dimension in vector spaces.
● To formulate and analyse complex engineering problems using the concepts of Geometric algebra.
● To explain techniques of calculus which are applied in the Engineering problems.
● To apply the techniques of Integration in finding area and volumes.

UNIT-I	MATRICES AND QUADRATIC FORMS	12
Matrices: Types - Symmetric and Skew – symmetric matrices, Hermitian matrix, Unitary matrix and Orthogonal matrices – Rank, Inverse and Trace of a matrix - Eigen values and eigenvectors- Diagonalization of matrices using orthogonal transformation -Quadratic forms -Reduction to canonical form using orthogonal transformation.		
UNIT-II	**VECTOR SPACES**	**12**
Vector spaces – Subspaces – Linear combinations and system of Linear equations – Linear independence and Linear dependence – Bases and Dimensions – Linear Transformation – Matrix representation of Linear Transformation - Null space, Range space and dimension theorem (without proof).		
UNIT-III	**GEOMETRIC ALGEBRA**	**12**
Two dimensional objects: Straight lines, Circles, Polygons -Three dimensional objects : Prisms, Cones, Cylinders, Spheres, Torus- Coordinate System :Cartesian and polar -Vectors: Scalar products and Vector products- Quaternion : arithmetic, quaternion as matrix- Transformation in plane- Rotation, Translation and Reflections- Introduction to parametric curves in planes.		
UNIT-IV	**FUNCTIONS OF SEVERAL VARIABLES**	**12**
Partial differentiation–Total derivative–Change of variables–Jacobians–Partial differentiation of implicit functions– Taylor's series for functions of two variables–Maxima and minima of functions of two variables–Lagrange's method of undetermined multipliers.		
UNIT-V	**MULTIPLE INTEGRALS**	**12**
Double integrals–Change of order of integration–Area enclosed by plane curves–Triple integrals–Volume of solids– Numerical computation of double integrals -Trapezoidal rule.		
Total Contact Hours: 60		

Course Outcomes: On completion of the course students will be able to
● Demonstrate various matrix techniques in solving the related problems in engineering and technology.
● Apply the concepts of basis and dimension in vector spaces to the solution of related complex engineering problems.
● Formulate and analyse complex engineering problems using the concepts of Geometric algebra.
● Interpret the problems in Engineering and Technology using the principles of mathematical calculus.
● Evaluate multiple integrals to conduct investigations of complex problems.

SUGGESTED ACTIVITIES:	Problem solving sessions (will be explain through online calculator)

SUGGESTED EVALUATION METHODS

Problem solving in Tutorial sessions
Assignment problems
Quizzes and class test
Discussion in classroom

Text Book(s):	
1.	Grewal B.S., " Higher Engineering Mathematics ", Khanna Publishers, New Delhi, 43rd Edition, 2014.
2.	Introduction to linear algebra, 5th Edition, Gilbert Strang, 2016. Wellesley Publishers.
3.	John Vince., " Geometric algebra for computer graphics" Springer.

Reference Books(s) / Web links:	
1.	Friedberg, A.H., Insel, A.J. and Spence, L., Elementary Linear Algebra, a matrix approach,2nd edition, Pearson, 2014.
2.	Erwin Kreyszig ," Advanced Engineering Mathematics ", John Wiley and Sons, 10th Edition, New Delhi, 2016.
3.	Bali, N.P. and Manish Goyal, A Text Book of Engineering Mathematics, Lakshmi Publications Pvt. Ltd., New Delhi, 2006.
4.	T Veerarajan, Engineering Mathematics –I , McGraw Hill Education, 2018.
5.	Ramana. B.V., " Higher Engineering Mathematics ", McGraw Hill Education Pvt. Ltd, New Delhi, 2018.

Subject Code	**Subject Name (Theory Course)**	**Category**	**L**	**T**	**P**	**C**

CD23111	DESIGN DRAWING AND SKETCHING	PC	2	1	0	3

Objectives:	
•	To enable drawing as a medium for observing, representing, conceptualizing, visualizing and communicating design ideas.
•	To develop an understanding of spatial concepts and the critical ability to think and visualize in three dimensions through the tactile nature of drawing.
•	To develop observational skills through the study of the environment and as a tool for visual representation, ideation/conceptualization, visualization and communication or presentation of design ideas through sketching and drawing from both observation and memory.

UNIT-I	INTRODUCTION TO DESIGN DRAWING	9

Introduction to Materials, Tools & Methods - different grades of pencils & exploring- Developing free finger, wrist hand & arm movement and initiate muscle- Introduction to Observation – Scrutinize, Examine, Study, Inspect Perceive, Sense, Feel, Notice, Identify, Understand- Training the eye to observe accurately to educate the visual sense- Introduction to Perception – View, Opinion, Insight, Discernment- Introduction to Perspective – Eye level, Vanishing Point

UNIT-II	DRAWING OF CUBES and PERSPECTIVES	9

Introduction to Vanishing Points, View Point, Eye Level, Horizon, Parallel & Converging Lines-One Point Perspective- Two Point Perspective-Three Point Perspective-Perspective in the Environment, Interior Spaces an Objects.

UNIT-III	OBJECT DRAWING and HUMAN FORM DRAWING	9

Introduction to other geometric forms like cylinder, cuboids etc.- Introduction to Object Drawing-How to observe – shape, proportions, effect of light on the objects etc.- Introduction to Human Form Proportions-Human Form – Object Relationships

UNIT-IV	GEOMETRY & STRUCTURE	9

Construction of Basic Polygons-Proportioning Systems: Golden Proportion- Interrelation of Polygons- Orthographic Projection of Planes and Solids-. Isometric Projection-Architectonic Drawing - Isometric Circles-Architectonic Planes with rounded surfaces, tube with square cross section with ellipse at different planes and tube with circular cross- section.

UNIT-V	VISUALISATION DRAWING	9

Introduction to Mental Imagery- Compositions inclusive of human forms, object, perspective etc- Sketching a mir environment outside the campus from memory- Sketching a visualized composition from imagination

	Total Contact Hours	:	45

Course Outcomes: On completion of the course students will be able to

•	Develop the skill & ability to observe and visually represent all the elements in their environment with a focus on human forms, objects and nature and the way they interact.
•	inculcate skills and develop the ability to explain the importance of precision in design through drawing using instruments/tools and concept of figures/configuration through basic geometrical patterns on 2D surfaces.
•	Develop the ability to discuss orthographic and isometric projections as fundamental tools of technical drawing and use technical drawings as a tool for visual communication.
•	Develop the ability to analyse visual structure of 3D forms on 2D surfaces with an exposure to the complexities of imagination and visualization.
•	Develop the ability to analyse complex images and in turn develop the ability to create mental imagerie and visualise concepts.

SUGGESTED EVALUATION METHODS
Character Sketching
Sketch from Memory
Digital Art Creation
Live Sketching
Story Board Development

SUGGESTED EVALUATION METHODS
Use of Various level of pencils
Quality of Drawing
Picture Perfect
Similarity of Script

Text Book(s):	
1	Erik Olofsson, Klara Sjolen, Design Sketching, KEEOS Design Books, 2005.
2	K . Morling, Geometric and Engineering Drawing, Third Edition, Graduate of the Institution of Mechanical Engineers, SI Units, Elsevier, 2010.
3	Brom, Sketching from the Imagination: An Insight into Creative Drawing, 3dtotal publishing, 2013.
4	Flint, Tom, Anatomy for the Artist: The Dynamic of the Human Form, London, Arcturus Publishing, 2017.

Reference Books(s):	
1	Koos Eissen, Roselien Steur, Sketching: The Basics, BIS Publishers, 2014.
2	Edwards, Betty, drawing on the Artist Within: An Inspirational and Practical Guide to Increasing Your Creative Powers, Simon & Schuster Inc., New York, 1987.

GE23117 **தமிழர் மரபு** **L T P C**

1 0 0 1

அலகு I மமமொழி மற் றும் இலக்கியம் : **3**

இந்திய ததமொழிக் குடும் பங் கள் - திதரொவிட ததமொழிகள் - தமிழ் ஒரு ததம் ததமொழி - தமிழ ததவ் விலக்கியங் கள் - த ங் க இலக்கியத்தின் த மய த த ொரபற்ற தன் மம - த ங் க இலககிய்

த்தில் பகிரதல

அறம் - திருக்குறளில் மமதலொண் மமக் கருத்Fக்கள் - தமிழிக் தகொப்பியங் கள் , தமிழகததில் த மண

ததபௌத்த த மயங் களின்ள் மற்றும் தநொயன் தமொரக ள் -

ததொக்கம் - பக்தி

இலக்கியம் ,
ஆழ்தவொரக

சிற்றிலக்கியங் கள் - - தமிழ் இலக்கிய யில
தமிழில் நவீன வளதரசி
இலக்கியத்தின்
வளதரசி
தபொரதிதயொர்
மற்றும்
தபொரதிததொத ன்
ஆகிமதயொரின் பங்
களிப்பு.

அலகு II மரபு - ம ொறற ஒவியங் கள் முதல் நவீன ஒவியங் கள் வறர - சிற் க் கறல:

3

நடுகல் முதல் நவீன சிற்பங் கள் வமர - ஐம் ததபொன் சிமலகள் - பழங் குடியினர் மற்றும் அவரகள ததயொரிக்கும் மகவிமனப் ததபொருட்கள் , ததபொம் மமகள் - மதர் ததய் யும் கமல - சுடுமண் சிற்பங் கள் - தநொடடுப்புறத் ததய் வங் கள் - குமரிமுமனயில்

திருவள்ளுவர் சிமல - இதமக் கருவிகள் -

மிருதங் கம் , பமற, வீமண, தயொழ் , ளின் த மூக ததபொருதளொததொர தவொழ் வில தநொதஸ் வரம் - தமிழரக மதகொவில் களின் பங் கு.

அலகு III மநொடடு ்புறக் கறலகள் மற் றும் வீர விறளமயொடடுகள் : **3**

ததருக்கூத்F, கரதகொடட்ம் , வில் லுப்தபொடடு, கணிதயொன் கூத்F, ஒயிதலொடட்ம் , மததொல் தபொமவக் கூத்F, சிலம் தபொட்டம் , வளரி, ளின் விமளதயொடடு கள் . புலிதயொட்டம் , தமிழரக

அலகு IV தமிழரக்ளின் திறறக் கமகொடம் ொடுகள் : **3**

தமிழகத்தின் ததொவரங் களும் , விலங் குகளும் - ததததொல் தகொப்பியம் மற்றும் த ங் க இலக்கியத்தில் அகம

மற்றும் புறக் மதகொடத் பொடுகள் - தமிழரகள் மதபொற்றிய அறகம் தகொடத் பொடு - த ங் கதகொலத்தில் தமிழத்தில எழுத்தறிவும் , கல் வியும் - த ங் கதகொல

நகரங் களும் Fமற முகங் களும் - த ங் கதகொலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல் கடந்த தநொடுகளில் ததமொழரகளின் தவற்றி.

அலகு V இந்திய கதசிய இயக்கம் மற் றும் இந்திய ற ் ம ொட்டிற்குத் தமிழரக்ளின ங் களி ்பு: 3

இந்திய விடுதமலப்மதபொரில் தமிழரகளின் பங் கு - இந்திதயொவின் பிறப்பகுதிகளில் தமிழ் ப் பண் தபொடடின் ததொக்கம் - சுயமரிதயொமத இயக்கம் - இந்திய மருத்Fவத்தில் , சித்த மருத்Fவத்தின பங் கு - கல் தவடடுகள் , மகதயழுத்Fப்படிகள் - வரதலொறு. தமிழ் ப் புத்தகங் களின் தஅசு

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரதலொறு - மக்களும் பண் தபொடும் - மக.மக. பிள்மள (தவளியீடு: தமிழ் தநொடு தபொடநூல் மற்றும் கல் வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் - முமனவர் இல. சுந்தரம் . (விகடன் பிரசுரம்).
3. கீழடி - மவமக நதிக்கமரயில் த ங் கதகொல நகர தநொகரிகம் (தததொல் லியல் Fமற தவளியீடு)
4. ததபொருமந - ஆற்றங் கமர தநொகரிகம் . (தததொல் லியல் Fமற தவளியீடு)
5. Social Life of Tamils (Dr. K. K. Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils – The Classical Period (Dr. S. Singaravelu)(Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr. S. V. Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by:

   International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies).
9. Keeladi – 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

Subject Code	Subject Name	Category	L	T	P	C
GE23131	**PROGRAMMING USING C**	ES	**1**	**0**	**6**	**4**
Common to						

Objectives:
● To develop simple algorithms for arithmetic and logical problems.
● To develop C Programs using basic programming constructs
● To develop C programs using arrays and strings
● To develop applications in C using functions , pointers and structures
● To develop applications using structures and union

List of Experiments
1. Overview of C, Constants, Variables and Data Types
2. Operators and Expressions, Managing Input and Output Operations
3. Decision Making and Branching
4. Decision Making and Looping
5. Nested Loops - while and for, Jumps in Loops
6. One-Dimensional Arrays
7. Searching Algorithms - Linear and Binary
8. Sorting Algorithms - Bubble and Selection
9. Two-Dimensional and Multi-dimensional Arrays
10. Character Arrays and Strings Handling Functions
11. User-Defined Functions - Recursive Functions
12. Passing Arrays and Strings to Functions
13. Scope, Visibility and Lifetime of Variables
14. Structures and Unions
15. Pointers
16. The Preprocessor
Platform Needed: GCC Compiler for Windows/Linux
Total Contact Hours: 90

Text Book(s):
1. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", Second Edition, PHI
2. Byron Gottfried, "Programming in C", Second Edition, Schaum Outline Series
Reference Books(s) / Web links:
● Herbert Schildt, "C: The Complete Reference", Fourth Edition, McGraw Hill.
● Yashavant Kanetkar, "Let Us C", BPB Publications
● E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
● NPTEL course , "Problem Solving Through Programming In C", By Prof. Anupam Basu, IIT Kharagpur

Course Outcomes:

On completion of the course, the students will be able to

●	Formulate simple algorithms for arithmetic and logical problems.
●	Implement conditional branching, iteration and recursion.
●	Decompose a problem into functions and synthesize a complete program using divide and conquer approach.
●	Use arrays, pointers and structures to formulate algorithms and programs.
●	Apply programming to solve matrix addition and multiplication problems and searching and sorting problems.

Suggested Activities
Practice small and tricky codes Practice problems in portals like Digital Café Debugging the codes Completing the function definitions etc.

CO - PO – PSO matrices of course

PO/PSO **CO**	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
GE19141.1	1	2	2	2	1	-	-	-	1	2	1	1	2	3	-
GE19141.2	1	1	1	1	1	-	-	-	-	-	1	1	2	2	-
GE19141.3	1	1	2	1	1	-	-	-	-	-	1	1	2	2	-
GE19141.4	2	2	3	2	1	-	-	-	1	-	2	1	2	2	2
GE19141.5	2	2	3	2	1	-	-	-	-	-	2	1	2	2	2
Average	**1.4**	**1.6**	**2.2**	**1.6**	**1.0**	**-**	**-**	**-**	**1.0**	**2.0**	**1.4**	**1.0**	**2.0**	**2.2**	**2.0**

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)No correlation: "-"

Subject Code	**Subject Name**	**Category**	**L**	**T**	**P**	**C**

PH23132	PHYSICS FOR INFORMATION SCIENCE (Common to -B.E.-CSE, CSD, Cyber Security &B.Tech.- IT, AIML)	BS	3	0	2	4

Objectives:

- To understand the principles of laser and fiber optics in engineering and technology.
- To analyze the properties of magnetic and superconducting materials.
- To understand the advanced concept of quantum theory and applications.
- To become proficient in semiconductor applications
- To become proficient in optoelectronic devices

UNIT-I	LASERS AND FIBER OPTICS	9

Lasers: Characteristics, Einstein's A and B coefficients derivation – resonant cavity, optical amplification (qualitative)

–Nd-YAG Laser, Semiconductor lasers: Homojunction and Heterojunction- Applications of Lasers. Fiber optics: principle, numerical aperture and acceptance angle - types of optical fibers (material, mode and refractive index) – losses associated with optical fibers -Fiber optic communication system - fiber optic sensors: pressure and displacement.

UNIT-II	MAGNETIC AND SUPERCONDUCTING MATERIALS	9

Magnetic dipole moment – atomic magnetic moments- magnetic permeability and susceptibility -Magnetic material classification: diamagnetism – paramagnetism – ferromagnetism – antiferromagnetism – ferrimagnetism – Domain Theory- M versus H behaviour – Hard and soft magnetic materials – examples and uses-– Magnetic principle in computer data storage. Superconductors: Properties - BCS theory (Qualitative)- Type-I and Type II superconductors - Magnetic levitation-SQUID-Cryotron.

UNIT-III	QUANTUM PHYSICS	9

Introduction- Quantum free electron theory-De Broglie's concept-Schrodinger wave equation-Time independent and time dependent equations-Physical significance of wave function - Particle in a one dimensional box – electrons in metals -degenerate states – Fermi- Dirac statistics – Density of energy states -Size dependence of Fermi energy – Quantum confinement – Quantum wells, Quantum wires, Quantum dots and Quantum clusters - Band gap of nanomaterials.

UNIT-IV	SEMICONDUCTOR PHYSICS	9

Intrinsic Semiconductors – Energy band diagram – direct and indirect band gap semiconductors – Carrier concentration in intrinsic semiconductors – Band gap determination- extrinsic semiconductors (Qualitative)-Hall effect -determination of Hall co-efficient-Formation of P-N junction-Forward bias-Reverse bias -Ohmic contact-Schottky diode- Tunnel diode.

UNIT-V	OPTOELECTRONICS	9

Classification of optical materials – carrier generation and recombination processes – Absorption, emission and scattering of light in metals, insulators and semiconductors (concepts only) – Photo electric effect-Photo current in a P- N diode – Photo transistor-solar cell - LED – Organic LED- Non Linear Optical materials-properties and applications.

	Contact Hours	:	45

List of Experiments	
1	Determine the wavelength of the laser using grating and size of the particle using diode laser.
2	Determine the numerical aperture and acceptance angle of optical fiber.
3	Study the permeability of the free space using Helmoltz coil.
4	Determine the hysteresis loss in the transformer core using B-H curve unit.
5	Determine the band gap of given semiconductor.
6	Determine the Hall coefficient of semiconducting material.
7	Determine specific resistance of the material of given wires using metre bridge.
8	Study the resonance frequency in series connected LCR circuits.
9	Determine the V-I characteristics of the solar cell.
10	Determine the thickness of the given specimen by using air wedge method.

	Contact Hours	**:**	**30**
	Total Contact Hours	**:**	**75**

Course Outcomes:	
On completion of the course, the students will be able to	
•	Use the concepts of Laser and Fiber optics in communication.
•	Use the properties of magnetic and superconducting materials in data storage devices.
•	Apply the concepts of electron transport in nanodevices.
•	Analyse the physics of semiconductor devices
•	Analyze the properties of optical materials for optoelectronic applications.
Suggested Activities	
•	Problem solving sessions
Suggested Evaluation Methods	
•	Quizzes
•	Class Presentation / Discussion
Text Book(s):	
1	Bhattacharya, D.K. & Poonam, T. “Engineering Physics”. Oxford University Press, 2015.
2	Jasprit Singh, “Semiconductor Devices: Basic Principles”, Wiley 2012.
3	Kasap, S.O. “Principles of Electronic Materials and Devices”, McGraw-Hill Education, 2007.
Reference Books(s) / Web links:	
1	S. O. Pillai, Solid state physics, New Age International, 2015.
2	Serway, R.A. & Jewett, J.W. “Physics for Scientists and Engineers”. Cengage Learning, 2010.
3	Hanson, G.W. “Fundamentals of Nanoelectronics”. Pearson Education, 2009.

List of Equipment Available

(Common to B.E. CSD and CSE &B.Tech. AI&DS, AI & ML, IT)

S. No	Name of the equipment	Quantity Required	Quantity Available	Deficiency
1	Wavelength of Laser and Characteristics -Laser source and grating plate	7	15	-
2	Laser - angle of divergence and NA acceptance angle	6	8	-
3	Determination of permeability of free space - Helmholtz coil setup	5	5	-
4	B-H curve Setup and CRO	6	7	-
5	Band gap of a semiconductor Setup	6	19	-
6	Hall coefficient of Semiconductor Setup	4	4	-
7	Determine specific resistance of the material of given wires-metre bridge	6	6	-
8	LCR circuit kit	6	7	-
9	Solar cell parameters setup	6	8	-
10	Thickness of thin wire-Air wedge method-Travelling Microscope, Glass Plate	8	13	-

CO - PO – PSO matrices of course

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	2	2	2	1	-	-	-	-	-	2	1	1	1
CO 2	3	3	2	2	3	1	1	-	-	-	-	2	1	1	1
CO 3	3	3	2	2	3	1	1	-	-	-	-	2	2	1	1
CO 4	3	3	2	2	3	1	1	-	-	-	-	2	2	1	1
CO 5	3	3	2	2	3	1	1	-	-	-	-	2	2	1	1
Average	3.00	3.00	2.00	2.00	2.80	1.00	0.00	0.00	0.00	0.00	0.00	2.00	1.80	1.00	1.00

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)No correlation: "-"

Subject Code	Subject Name	Category	L	T	P	C

GE23122	ENGINEERING PRACTICES - ELECTRICAL AND ELECTRONICS	ES	0	0	2	1

Objectives:

- To provide hands-on experience on various basic engineering practices in Electrical Engineering.
- To provide hands-on experience on various basic engineering practices in Electronics Engineering.

List of Experiments

A. ELECTRICAL ENGINEERING PRACTICE

1	Residential house wiring using switches, fuses, indicators, lamp and energy meter.
2	Fluorescent lamp wiring.
3	Stair case wiring.
4	Measurement of electrical quantities – voltage, current, power & power factor in RL circuit.
5	Measurement of earth resistance using Megger.
6	Study of Ceiling Fan and Iron Box

B. ELECTRONICS ENGINEERING PRACTICE

1	Study of electronic components and equipment – Resistor, colour coding, measurement of AC signal parameters (peak-peak, RMS period, frequency) using CRO/DSO.
2	(a) Measurement of electrical quantities using Multimeter (b) Testing of electronic components.
3	Study of logic gates : AND, OR, EXOR and NOT.
4	Generation of Clock Signals.
5	Soldering practice – Components Devices and Circuits – Using general purpose PCB.
6	Measurement of ripple factor of Half-wave and Full-wave Rectifiers.

Total Contact Hours	**:**	**30**

Course Outcomes:

On completion of the course, the students will be able to

- fabricate the basic electrical circuits
- implement the house wiring circuits
- fabricate the electronic circuits
- verify the truth table of logic gates
- design the Half-wave and Full-wave Rectifiers using diodes and passive components

SUGGESTED EVALUATION METHODS

- Experiment based Viva

REFERENCE

1	Bawa H.S., “Workshop Practice”, Tata McGraw – Hill Publishing Company Limited, 2007.

2	Jeyachandran K., Natarajan S. &Balasubramanian S., "A Primer on Engineering Practices Laboratory", Anuradha Publications, 2007.
3	Jeyapoovan T., Saravanapandian M. &Pranitha S., "Engineering Practices Lab Manual",Vikas Publishing House Pvt.Ltd, 2006.
4	Rajendra Prasad A. &Sarma P.M.M.S., "Workshop Practice", SreeSai Publication, 2002.

Lab Equipment Required:

Sl. No	**Name of the Equipment**	**Quantity Required**
1	Residential house wiring using switches, fuse, indicator, lamp and energy	3Nos
2	Fluorescent lamp wiring.	3 Nos
3	Stair case wiring	3 Nos
4	Measurement of electrical quantities – voltage, current, power & power	2 Nos
5	Study purpose items: Iron box, Ceiling fan.	2 each
6	Megger (250V/500V)	2 Nos.
7	Soldering guns	10 Nos.
8	Assorted electronic components for making circuits	50 Nos.
9	Small PCBs	10 Nos.
10	Multimeters	10 Nos.
11	Digital trainer kit	5 Nos.
12	CRO	8 Nos.
13	Transformer	8 Nos.
14	Function Generator	8 Nos.

CO - PO – PSO matrices of course

COs/POs&PSOs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PS**
CO 1	3	3	3	2	-	-	2	-	3	2	-	3			
CO 2	3	3	2	2	-	-	2	-	3	2	-	3			
CO 3	3	3	3	2	-	-	2	-	3	2	-	3			
CO 4	3	3	3	2	-	-		-	3	2	-	3			
CO 5	3	3	3	2	-	-		-	3	2	-	3			
Average	**3**	**3**	**2.67**	**2**	**-**	**-**	**2**	**-**	**3**	**2**	**-**	**3**			

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)No correlation: "-"

Subject Code	**Subject Name (Theory course)**	**Category**	**L**	**T**	**P**	**C**

MC23111	Indian Constitution and Freedom Movement	Theory	3	0	0	0
Common to all branches of B.E/B. Tech Programmes – First / Second/third Semester						

Objectives:
To apprehend the sacrifices made by the freedom fighters.
To inculcate the values enshrined in the Indian constitution.
To instil a sense of responsibility as the citizens of India.
To familiarise about the functions of the various levels of Government.
To be informed about Constitutional and Non- Constitutional bodies.

UNIT-I	**INDIAN FREEDOM MOVEMENT**	9
British Colonialism in India-Colonial administration till 1857- Revolt of 1857- Early Resistance to British Rule-Rise of Nationalism in India-Indian Freedom Struggle under Mahatma Gandhi-Non- Cooperation Movement-Civil Disobedience Movement- Quit India Movement-British Official response to National movement- Independence of India Act 1947-Freedom and Partition.		
UNIT-II	**CONSTITUTION OF INDIA**	9
Historical Background – Indian Constitution: Constitution' meaning of the term, Sources and constitutional history, Constituent Assembly of India – Philosophical foundations of the Indian Constitution – Preamble – Fundamental Rights – Directive Principles of State Policy – Fundamental Duties – Citizenship – Constitutional Remedies for citizens.		
UNIT-III	**STRUCTURE AND FUNCTIONS OF CENTRAL GOVERNMENT**	9
Union Government – Structure of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India – Judicial Review.		
UNIT-IV	**STRUCTURE AND FUNCTION OF STATE GOVERNMENT AND LOCAL BODY**	9
State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – Judicial System in States – High Courts and other Subordinate Courts- Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Pachayati Raj: Introduction, Elected officials and their roles, Village level: Role of Elected and Appointed officials.		
UNIT-V	**CONSTITUTIONAL FUNCTIONS AND BODIES**	9
Indian Federal System – Centre – State Relations – President's Rule – Constitutional Functionaries – Assessment of working of the Parliamentary System in India- CAG, Election Commission, UPSC, GST Council and other Constitutional bodies-. NITI Aayog, Lokpal, National Development Council and other Non –Constitutional bodies.		
Total Contact Hours: 45		

Course Outcomes: Upon completion of the course, students will be able to:
appreciate the sacrifices made by freedom fighters during freedom movement.
be responsible citizens and abide by the rules of the Indian constitution.
be aware of the functions of the Indian government.

 be knowledgeable about the functions of the state Government and the Local bodies.

 apply the knowledge on constitutional functions and role of constitutional bodies and non-constitutional bodies.

SUGGESTED ACTIVITIES

- Famous speeches from around the world relating to independence Case study
- Quiz on Portfolio and Cabinet
- Discussions on International Associations like the UN, BRICS, QUAD
- Presentation on issues around the world

SUGGESTED EVALUATION METHODS

- Assignment topics
- Quizzes
- Class Presentation/Discussion
- Continuous assessments (CAT)

Text Book(s):

1. M. Laxmikanth , "Indian Polity:, McGraw-Hill, New Delhi.
2. Durga Das Basu, "Introduction to the Constitution of India ", Lexis Nexis, New Delhi. 21st ed 2013.
3. P K Agarwal and K N Chaturvedi ,PrabhatPrakashan, New Delhi, 1st ed , 2017.

Reference Books(s) / Web links:

1. Sharma, Brij Kishore, "Introduction to the Constitution of India:, Prentice Hall of India, New Delhi.
2. U.R.Gahai, "Indian Political System ", New Academic Publishing House, Jalaendhar
3. Bipan Chandra, India's Struggle for Independence, Penguin Books, 2016.
4. Maciver and Page, "Society: An Introduction Analysis ", Mac Milan India Ltd., New Delhi.2nd ed, 2014.
5. Bipan Chandra, History of Modern India, Orient Black Swan, 2009.

Course Code	Course Title	Category	L	T	P	C
MA23214	PROBABILITY AND INFERENTIAL STATISTICS	BS	3	1	0	4
Common to II Sem. B.E.– CSD and B.Tech. - AI&DS and AI&ML						

Objectives:

- To analyse data pertaining to discrete and continuous variables and to interpret the results in the given situation.
- To explain the data that we are interested by using hypothesis testing and to draw conclusions about the population using sample data.
- To identify the strength and direction of a linear relationship between two variables and using regression and correlation to predict dependency for data-driven decisions regarding our processes.
- To Characterize, compare, and contrast different nonparametric hypothesis tests.
- To Model time series to analyses the underlying structure(s) in both the time and frequency domains.

UNIT-I	**PROBABILITY - BAYES THEOREM**	**12**
Probability models and axioms- Conditioning and Bayes' rule – Discrete random variables: Binomial and Poisson distributions - Multiple discrete random variables: joint PMFs, expectations, conditioning- Continuous random variables: Uniform and Gaussian distributions - Multiple continuous random variables- Continuous Bayes rule.		
UNIT-II	**STATISTICAL TESTING**	**12**
Bayesian statistical inference -Maximal Likelihood estimation: Parameters of Binomial and Poisson distribution- Test of significance – Z test: Single mean, difference of means -Chi square - F test.		
UNIT-III	**LINEAR STATISTICAL MODELS**	**12**
Scatter diagram- Linear Regression and Correlation- Least squares method- Rank correlation- Multiple regression and multiple correlation- Analysis of variance (one way, two way).		
UNIT-IV	**NON PARAMETRIC TESTS**	**12**
Sign test -Wilcoxon signed rank test - Mann Whitney test - Run test - Kolmogorov Smirnov test - Spearmann and Kendall's test - Tolerance region.		
UNIT-V	**BASICS OF TIME SERIES**	**12**
Stationary Time Series - ARIMA models: Identification, Estimation and Forecasting.		
Total Contact Hours: 60		

Course Outcomes:

On completion of the course students will be able to
● Apply the basic concepts of probability and random variables in complex engineering problems.
● Obtain statistical data from experiments and to analyze the same using statistical test to conduct investigations of complex problems in engineering.
● Use the concepts of regression and correlation in real life problems such as predict trends and adjust product and services or advertising and marketing campaigns. That is,analyze complex engineering problems reaching substantiated conclusions.
● Formulate, test and interpret various nonparametric tests for problems in engineering and technology. That is, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
● Run and interpret time series models and regression models and reaching substantiated conclusions in relevant engineering problems using time series.

SUGGESTED ACTIVITIES

- Problem solving sessions
- MATLAB and GeoGebra
- Time series forecasting using R program

SUGGESTED EVALUATION METHODS

- Problem solving in Tutorial sessions
- Assignment problems
- Quizzes and class test
- Discussion in classroom

Text Book(s):

1.	T. Veerarajan, 'Probability, Statistics and Random Processes with Queueing Theory and Queueing Networks' ,McGraw Hill, 2016.
2.	Goon, M. Gupta and B. Dasgupta, "Fundamentals of Statistics", Vol. I & II, A., World Press.
3.	Grewal B.S., " Higher Engineering Mathematics ", Khanna Publishers, New Delhi, 43rd Edition, 2014.
4.	John F. Shortle, James M. Thompson, Donald Gross, Carl M. Harris, "Fundamentals of Queueing Theory", Wiley series in Probability and Statistics, 5thedition, 2018.

Reference Books(s) / Web links:

1.	S.M. Ross, "A first course in Probability", Prentice Hall,8th edition, 2010.
2.	R. Johnson, "Miller &Freund's Probability and Statistics for Engineers", (9th Edition), PHI.
3.	Trivedi.K.S., "Probability and Statistics with Reliability, Queueing and Computer Science Applications", John Wiley and Sons, 2016.
4.	Chris Chattfield, "The analysis of Time series: An Introduction " .

Subject Code	Subject Name (Theory Course)	Category	L	T	P	C
CD23211	Foundation in Digital Story Telling	PC	3	0	0	3

Objectives:

- To learn writing and structuring story for different genres and why a script should be written in a particular format ● To consider the relationship between what is being communicated to target audience/viewer.
- To analyze and explore forms of communication and media through a variety of design disciplines and techniques
- To develop theoretical and practical knowledge of a range of media using problem- finding skills, culminating in design and production of a finished piece of work.
- To understand the various stages to a professional workflow.

UNIT-I	INTRODUCTION TO STORY TELLING	9

Introduction to storytelling –Types of stories – discussion of convention storytelling – Genre - Elements of Story - Theme & Plot, One line story, Story with a Message, Arch, Anti & Mini Plot - Story, storyline, plot, and treatment - Principles of suspense and surprise

UNIT-II	STORY TELLING AND FILM LANGUAGE	9

Role of Drama in Story Telling - Storytelling through Camera - Storytelling through Editing - Storytelling through use of Sound & Music - Storytelling in Cinema - Basics of film language: Sequence, Scene, shot, Frame, Types of shots, Camera angles, Camera movements, Editing, Continuity, Composition - The art of staging - Mis-en-scene.

UNIT-III	IDEATION AND CREATIVITY	9

The ideation and creativity in binding a story - How to turn a small idea into a full story? - Carving well-rounded characters for a script - Write a synopsis for your screenplay - Build your synopsis into an outline - Screenwriting: 3 Act Structure - Setup,

Confrontation and Resolution; Hero's Journey - Different stages of Hero's Journey; Conflict & Cliché - Elements of Screenwriting - Foreshadowing, Flash Back, Time Travel; Rise & Fall and Climax & Resolution - Managing Conflicts.

UNIT-IV	CREATING A STORY	9

Creating Compelling Characters - Using Archetypes to Flesh Out Character - The Hero's Journey - Creating Treatments that Sell - Developing the Perfect Beginning and Ending - Making Your Theme Resonate - Crafting Dialogue that Rings True - Creating Action that Packs a Punch - Controlling Pacing.

UNIT-V	SCREENPLAY AND PITCHING	9

Screenplay Formatting - Formats and adaptation of a screenplay - Designing the Perfect Logline - Online Resources for Screenwriters - Art of reading a script - Understanding Script dynamics - Most used software's for writing the screenplay - Pitching your story to the production houses in few minutes - Marketing Your Screenplay.

Total Contact Hours: 45

Course Outcomes:

• Effectively utilize relevant technical concepts and theories. • Analyze and evaluate methods of communication and appropriateness of media within a specialist area and describe basic skills. • Layout and present a script in a professional manner. • Develop an idea into a workable story. • Critique scripts, diagnose problems and find solutions.	
Text Books(s):	
1	Field, Syd, "Selling Screenplay: The Screenwriter"s Guide to Hollywood", New York, Dell Publishing, 1989.
2	Field, Syd, "Selling Screenplay: The Screenwriter"s Guide to Hollywood", New York, Dell Publishing, 1989.
3	Meyer, William, "Screen Writing for narrative film and TV", Collumbus Books, London, (1989).
4	Rib Davis, "Writing Dialogue for Scripts", Bloomsbury Academic, 2016.
5	Robert McKee, "Story: Style, Structure, Substance, and the Principles of Screenwriting", It Books; 1 edition, 1997.
Reference Books(s):	
1	Wood, Julia T, "Communication mosaics: An introduction to the field of Communication", 2001.
2	Emory A Griffin, "A first look at communication theory", 3rd edition, New York: McGraw-Hill, 1997.
3	Griffin, Em, "A First Look at Communication Theory", New York: McGraw-Hill, 2006.
4	Miller, K., "Communication Theories: Perspectives, processes, and contexts", 2nd edition, New York
5	Umberto Eco, "A Theory of Semiotics", Indiana University Press, 1975.
Web link(s):	
1	https://www.masterclass.com/articles/how-to-tell-a-story-effectively
2	https://www.inc.com/paul-jarvis/the-5-common-elements-of-good-storytelling.html
	https://hbr.org/2003/06/storytelling-that-moves-people

CO -PO–PSO matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CD19P03.1	**0**	**1**	**2**	**2**	**2**	**3**	**1**	**1**	**1**	**2**	**1**	**3**	**0**	**1**	**3**
CD19P03.2	**0**	**1**	**2**	**2**	**2**	**3**	**1**	**1**	**1**	**2**	**1**	**3**	**0**	**1**	**3**
CD19P03.3	**0**	**1**	**2**	**2**	**2**	**3**	**1**	**3**	**1**	**2**	**1**	**3**	**0**	**1**	**3**
CD19P03.4	**0**	**1**	**2**	**2**	**2**	**3**	**1**	**1**	**1**	**2**	**1**	**3**	**0**	**3**	**3**
CD19P03.5	**0**	**1**	**2**	**2**	**3**	**3**	**1**	**1**	**1**	**2**	**1**	**3**	**0**	**3**	**3**
Average	**0**	**1**	**2**	**2**	**2.2**	**3**	**1**	**1.4**	**1**	**2**	**1**	**3**	**0**	**1.8**	**3**

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)No correlation: "-"

GE23217 தமிழரும் மதொழில் நுட் மும் **L T P C**
1 0 0 1

அலகு I மநசவு மற் றும் ம ொறனத் மமதொழில் நுட் ம் : 3

த ங் க தகொலத்தில் ததநவுத் தததொழில் - தபொமனத் தததொழில் நுடப்ம் - கருப்பு சிவப்பு தபொண் டங் கள்

-

பண் டங் களில் கீறல் குறியீடுகள் .

அலகு II வடிவறம ்பு மற் றும் கட்டிடத் மமதொழில் நுட் ம் : 3

த ங் க தகொலத்தில் வடிவமமப்பு மற்றும் கடடுதமொனங் கள் & த ங் க தகொலத்தில் வீடடுப்பததபொருட்களில வடிவமமப்பு - த ங் க தகொலத்தில் கடடுதமொன ததபொருடகளும் நடுகல் லும் - சிலப்பதிதகொரத்தில் மமமட அமமப்பு பற்றிய விவரங் கள் - தமொமல் லபுதர் சிற்பங் களும் , மதகொவில் களும் - ததமொழர் தகொலத்Fப் தபருங் மதகொயில் கள் மற்றும் பிற வழிதபொடடுத் தலங் கள் - தநொயக்கர் தகொலக் மதகொயில் கள் - தமொதிரி கட்டமமப்புகள் பற்றி அறிதல் , மFமர மீதனொட்சி அம் மன் ஆலயம் மற்றும் திருமமல தநொயக்கர மத ொல் - ததட்டிதநொடு வீடுகள் - பிரிடடிஷ் தகொலத்தில் ததன் மனயில் இந்மததொ - த த ொமதரொததனிக் கடடிடக் கமல.

அலகு III உற் த்தித் மமதொழில் நுட் ம் : 3

கப்பல் கடடும் கமல - உமதலொகவியல் - இரும் புத் தததொழிற்த த ொமல - இரும் மப உருக்குதல் , எஃகு - வரதலொற்றுத ் த த ொன் றுகதளொக ததம் பு மற்றும் தங் க தநொணயங் கள் - தநொணயங் கள் தஅத டித்தல் - மணி உருதவொக்கும் தததொழிற்த த ொமலகள் - கல் மணிகள் , கண் தணொடி மணிகள் - சுடுமண் மணிகள் - த ங் கு மணிகள் - எலும் புத்Fண் டுகள் - தததொல் லியல் த த ொன் றுகள் - சிலப்பதிதகொரத்தில் மணிகளின் வமமகள் .

அலகு IV கவமளொற்்் றம மற் றும் நீ ர் ்ம ொசனத் மமதொழில் நுட் ம் : 3

அமண, ஏரி, குளங் கள் , மதகு - ததமொழரதகொலக் குமுழித் □ம் பின் முககியத்Fவ் ம் - தகொல் நமட

பதரொமரிப்பு - கல் நமடகளுக்தகொக வடிவமமக்கப்படட் கிணறுகள் - மவதளொண் மம மற்றும மவதளொண் மதம் த த ொரந்த ததயல் தபொடுகள் - கடல் த த ொர் அறிவு - மீன் வளம் - முத்F மற்றும முத்Fக்குளித்தல் - தபருங் கடல் குறித்த பண் மடய அறிவு - அறிவுத த ொர் த மூகம் .

அலகு V அறிவியல் தமிழ் மற் றும் றகித்தமிழ் : 3

அறிவியல் தமிழின் - கணித்தமிழ் வளதரசி - தமிழ் நூல் கமள மின் பதிப்பு வளதரசி ததய் தல் -

தமிழ் தமன் ததபொருடகள் உருதவொக்கம் - தமிழ் இமணயக் கல் விக்கழகம் - தமிழ் மின் நூலகம்

- இமணயத்தில் தமிழ் அகதரொதிகள் -
தததொற்குமவத் திடட்ம் .

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரதலொறு - மக்களும் பண் தபொடும் - மக.மக. பிள்மள (தவளியீடு: தமிழ் தநொடு தபொடநூல் மற்றும் கல் வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் - முமனவர் இல. சுந்தரம் . (விகடன் பிரசுரம்).
3. கீழடி - மவமக நதிக்கமரயில் த ங் கதகொல நகர தநொகரிகம் (தததொல் லியல் Fமற தவளியீடு)
4. ததபொருமந - ஆற்றங் கமர தநொகரிகம் . (தததொல் லியல் Fமற தவளியீடு)
5. Social Life of Tamils (Dr. K. K. Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils – The Classical Period (Dr. S. Singaravelu)(Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr. S. V. Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by:

   International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies).
9. Keeladi – 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

Subject Code	Subject Name(Lab Oriented Theory Course)	Category	L	T	P	C
CD23231	Visual Communication Foundations	PC	2	0	4	4

Objectives:	
•	To understand the principles of the visual language and their semantic use. A multi- disciplinary domain, design consists of, aesthetics, architecture, products, communication, processes, systems, technology, business/commerce, ramification on environment and society and demands.
•	To communicate more concisely and in a visually appropriate manner, it is necessary to use commonly understood principles, perspective and design layout standards.
•	To understand the fundamentals of Typography and Photography.

UNIT-I	INTRODUCTION TO VISUAL DESIGN	6
Importance of understanding visual language-its relation in context to nature and environment-Exploring and understanding Dots, Lines, Forms, Space, Pattern, Texture and Colors as an element of visual language		
UNIT-II	**INTRODUCTION TO THE PRINCIPLES OF VISUAL LANGUAGE**	**6**
Visual explorations and experiments with Form, Color, and Space, Texture, in relation to the context and environments – Concepts of harmony, balance, contrast, proportion, order, symmetry, asymmetry, rhythm, tension, juxtaposition, proximity, size, scale, proportion, orientation, alignment, variety, gradation, dominance, subordination, transition etc.		
UNIT-III	**INTRODUCTION TO FUNDAMENTALS OF TYPOGRAPHY**	**6**
Introduction to Type and its History-Type as a form and means of communication in our environment-Introduction to Indian type: Vernacular letter-forms-Classification of types: Typefaces, type families and type designers-Anatomy of the type: x height, ascenders, descenders, counter, cap-height, baseline, etc-Typographic variables: Kerning, tracking, leading, spacing etc.-Semantics of type: Legibility & readability.		
UNIT-IV	**INTRODUCTIONTOPHOTOGRAPHY**	**6**
Introduction and Orientation: Art and Science of Photography. Drawing out parallels / differences between the EYE and the CAMERA-Camera: Understanding the various controls on a Digital SLR Camera Features and Details. Shooting Modes. Aperture and Depth of Field. Shutter Speed. Critical Shutter Speeds and Effects-Exposure: Exposure as function of Quantity of Light and Time. Getting used to shooting in Manual Mode and learning to measure light using the camera's built-in exposure meter-Film Speed/Sensor Sensitivity: Understanding the role of sensitivity in Exposure. ISO/ASA and Digital Noise-Lenses: Different Types of Lenses. Classification of Lenses by Focal Lengths. Angle of View. Fixed Focal Length and Zoom Lenses. Close up and Macro Lenses-Light and Color Temperature- Digital Post-Production: Introduction to File-Formats. RAW vs.JPG. Understanding resolution, resizing and basic image post processing using Photoshop. Exploring the software to visualize and create digital mosaics.		
UNIT-V	**INTRODUCTION TO VIDEOGRAPY**	**6**
Concept development- Storyboarding-Video Shooting - Framing, Camera movement etc., Video Editing Defining communication -Sender, Channel and Receiver-Semiotics - Study of sign process (semiosis), meaning making and meaningful communication. Sign, Signifier, Signified-Denotation and Connotation- Story, narrative and see different perspectives - Identifying problems, opportunities and improvements. Differentiating problem, need and conflict -Persona study-Scenario study.		
Contact Hours : 30		

List of Experiments	
1	Design an object using Points, Lines, Planes and Textures and their relationships in context to nature and environment.
2	Design a digital environment in context to nature using Forms, Spaces and Patterns.
3	Sketch a character using various colours, colour harmonies and colour wheel.
4	Design a new Type Face.
5	Design a Poster by exploring different type faces, colours, textures and patterns.
6	Design a new infographic for displaying percentage of results.

7	Explore different types of cameras, lenses and list out the variations between them.
8	Design an album of pictures by differentiating various ISO levels, exposure, shutter speed and white balance.
9	Design a composition of pictures with a relationship between each picture.
10	Edit the pictures from the composition using various tools in photoshop.
11	Develop a storyboard by Identifying Theme/Subject/Topic/Story/Pont of View & Research.
12	Shoot and edit a video sequence using storyboard, framing and camera movement.
Contact Hours : 60 **Total Contact Hours: 90**	

Course Outcomes: On completion of the course students will be able to	
●	Develop the ability to create visual compositions using basic elements and by applying appropriate principles of visual composition to communicate
●	Develop the ability to perceive, visualize, and communicate visual elements as visual narratives
●	Develop the ability to apply the dynamics of visual design in Typography and Photography.
●	Develop the ability to address simple communication problems through a visualization process and construct mental imageries
●	Demonstrate the ability to plan, develop, design and execute communication products

SUGGESTED ACTIVITIES

Design Patterns and Brushes

Design a New Font family

Capture photos using golden rule

Develop a short clip

SUGGESTED EVALUATION METHODS

Use of Appropriate lens

Design of Fonts using Proper Scale

Narration of Script

Quality of Videos

Text Books(s):	
1	Wallschlaeger, Charles, & Busic-Synder, Cynthia, Basic Visual Concepts and Principles for Artists, Architects and Designers, McGraw-Hill,(2010).
2	Blain Brown, Cinematography: Theory and Practice: Image Making for Cinematographers and Directors, A Focus Press Book, 2016
3	Paul McNeil, The Visual History of Type, Laurence King Publishing. 2017

Reference Books:	
1	Buxton, Bill, Sketching User Experience: Getting the Design Right and the Right Design (Interactive Technologies), Morgan Kaufmann, (2007).
2	Caplin, Steve; Banks, Adam,The Complete Guide to Digital Illustration, Publisher: Watson - Guptill Publications, (2003).

Subject Code	Subject Name (Theory course)	Category	L	T	P	C
IT23231	Digital Principles and Computer Architecture	PC	3	0	2	4
Common to AIML, AIDS, CSD						

Objectives:

To introduce basic postulates of Boolean algebra and the methods for simplifying Boolean expressions. To introduce Logi Gates and implementation of logic function using logic gates

To outline the formal procedures for the analysis and design of combinational and sequential circuits

To learn the basic structure and operation of digital computer.

To familiarize the students with arithmetic and logic unit and implementation of fixed point and floating-point arithmeti operations

To expose and make the students to learn about the memory system design and different ways of communicating with I/O devices and standard I/O interfaces.

UNIT-I	MINIMIZATION TECHNIQUES	9

Number System and Complements: Number System - Boolean postulates and Laws – De-Morgan's Theorem – Princip of Duality – Boolean Expression – Minimization of Boolean expressions -Sum of Products (SOP) – Product of Sums (POS **Minimization Techniques:** Minimization of Boolean expressions using Boolean laws - Karnaugh map - Don"t ca conditions. **Logic Gates :** Basic Logic Gates- Universal Gates.

UNIT-II	COMBINATIONAL AND SEQUENTIAL CIRCUITS	9

Combinational Circuits : Adder - Subtractor –Multiplexer- De multiplexer – Decoder – Encoder.

Sequential Circuits: Latches – Flip Flops – Shift Registers – Counters : Ripple – Synchronous Counter

UNIT-III	INTRODUCTION TO COMPUTER ARCHITECTURE & INSTRUCTIONS	9

Introduction: Eight Great ideas in Computer Architecture – Components of a computer system – Technology for buildin processor and memory – Performance – Power wall.

Instructions: Operations of Computer Hardware – Operands of Computer Hardware - Representing instructions in Computer - Logical operations – Instructions for decision.

UNIT-IV	ARITHMETIC AND LOGIC UNIT	9

Design of ALU, Integer Arithmetic: Addition, Subtraction, Multiplication and Division – Floating Point Arithmet Representation, Addition, subtraction, Multiplication.

UNIT-V	MEMORY AND I/O SYSTEMS	9

Memory hierarchy - Memory technologies – Cache basics – Measuring and improving cache performance - Virtual memo – TLBs, Input/output system, programmed I/O, DMA and interrupts, I/O processors. Case Study: RAID

Total Contact Hours: 45

Description of the Experiments	Total Contact Hours: 30

1. Design and Implementation Basic Logic Gates – AND, OR and NOT

2. Design and Implementation Universal Gates – NAND and NOR

3. Design and Implementation of Half Adder using logic gates

4. Design and Implementation of Full Adder using logic gates

5. Design and Implementation of Half Subtractor using logic gates

6. Design and Implementation of Full Subtractor using logic gates

7. Design and Implementation of Multiplexer using logic gates.

8. Design of Registers

9. Design of Counters

10. Design of ALU

Total Contact Hours: 75

Course Outcomes:

On completion of the course students will be able to

- Simplify the Boolean expressions using basic postulates of Boolean algebra with suitable minimization techniques Understand the use of electronic circuits involved in the design of logic gates.
- Apply the procedure to design and implement combinational and sequential circuits.
- Understand the impact of instruction set architecture on cost-performance of computer design.
- Perform computer arithmetic operations.
- Evaluate the performance of memory systems.

SUGGESTED ACTIVITIES

Problem solving sessions

MATLAB and GeoGebra

Time series forecasting using R program

SUGGESTED EVALUATION METHODS

Problem solving in Tutorial sessions

Assignment problems

Quizzes and class test

Discussion in classroom

Text Book(s):

1. M. Morris Mano, Michael D. Ciletti "Digital Design", 6th Edition, Pearson, Prentice Hall, August 2018.

2. David A. Patterson and John L. Hennessey, "Computer organization and design", Fifth edition, Elsevier, 2014.

Reference Books(s) / Web links:

Charles H.Roth, "Fundamentals of Logic Design", 7th Edition, Thomson Learning, 2014.

Thomas L. Floyd, “Digital Fundamentals”, 10th Edition, Pearson Education Inc, 2011.
Charles H.Roth. “Fundamentals of Logic Design”, 6th Edition, Thomson Learning, 2013.
Donald D.Givone, “Digital Principles and Design”, TMH, 2003.
Vincent P. Heuring, Harry F. Jordan, “Computer System Architecture”, 2nd Edition, Pearson Education,2005.
Govindarajalu, “Computer Architecture and Organization, Design Principles and Applications”, 1st edition, Tata McGraw Hill, New Delhi, 2005.
John P Hayes, “Computer Architecture and Organization”,3rd edition, McGraw Hill, 2002.
V.CarlHamacher, Zvonko G. Varanesic and Safat G. Zaky, “Computer Organisation”, 6th edition, Mc Graw-Hill Inc, 2012.
William Stallings, “Computer Organization and Architecture Designing for performance”, 10th Edition, PHI Pvt. Ltd., Eastern Economy Edition 2016

Web Links for Virtual Lab (If any)
http://vlabs.iitkgp.ernet.in/coa/
https://www.vlab.co.in/broad-area-computer-science-and-engineering
https://cse11-iiith.vlabs.ac.in/

CO - PO – PSO matrices of course

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation: "-"

Subject Code	Subject Name (Lab Oriented Theory Course)	Category	L	T	P	C
CS23231	**Data Structures**	PC	**3**	**0**	**4**	**5**

Objectives:	
●	To apply the concepts of Linked List in the applications of various linear data structures.
●	To demonstrate the understanding of stacks, queues and their applications.
●	To apply the concepts of Linked List in the applications of various nonlinear data structures.
●	To understand the implementation of graphs and their applications.
●	To be able to incorporate various sorting and hashing techniques in real time scenarios

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO 8	P O9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO 1	3	3	3	-	-	-	-	-	-	-	-	-	2	2	-
CO 2	3	2	3	-	-	-	-	-	-	-	-	-	2	1	2
CO 3	2	2	1	1	-	1	-	-	-	-	-	-	2	2	2
CO 4	3	3	1	2	-	-	-	-	2	-	1	-	2	2	2
CO 5	2	2	3	1	2	2	2	-	-	-	2	-	2	-	-
Average	2.6	2.4	2.2	1.33	2	1.5	2	-	2	-	1.5	-	2	1.75	2

UNIT-I	**Linear Data Structure –List**	**9**
Self-Referential Structures, Dynamic Memory Allocation, Linked list implementation - Singly Linked List, Doubly Linked List, Circular Linked List, Applications of List.		
UNIT-II	**Linear Data Structure –Stack and Queue**	**8**

Stack – Operations, Array and Linked list implementation, Applications – Evaluation of Arithmetic Expressions, Queues- Operations, Array and Linked list Implementation.		
UNIT- III	**NonLinear Data Structure –Trees**	**10**
Tree Terminologies, Binary Tree Representation, Tree Traversals, Binary Search Trees, Binary Heap, Height Balance Trees – AVL Trees.		
UNIT- IV	**NonLinear Data Structure –Graph**	**9**
Representation of Graphs, Topological Sort, Depth First Search and Breadth-First Search , Minimum Spanning Tree – Prim's Algorithm, Shortest path algorithm – Dijikstra's Algorithm.		
UNIT-V	**Sorting and Hashing**	**9**
Sorting Techniques –Insertion Sort, Quick Sort, Merge Sort, Hashing- Hashing functions – Mid square, Division, Folding, Collision Resolution Techniques – Separate Chaining – Open Addressing – Rehashing.		
Contact Hours		**45**

Course Outcomes: **On completion of the course, the students will be able to**	
●	Understand and apply the various concepts of Linear data Structures
●	Understand and apply the various concepts of Non Linear data Structures.
●	Understand and apply the various sorting and Hashing concepts.
●	Analyse and apply the suitable data structure for their research.
●	Choose efficient data structures and apply them to solve real world problems.

SUGGESTED ACTIVITIES

- **Role play-** Linked List **(Unit 1).**
- **Mind Map, Poster Design -** Stack and Queue **(Unit 2).**
- **Flipped Classroom -** Binary Heap **(Unit 3).**
- **Poster Design -** Graph **(Unit4).**
- **Implementation of small module-** Hashing **(Unit5).**

SUGGESTED EVALUATION METHODS

- **Assignment problems -** Linked List **(Unit 1).**
- **Tutorial problems -** Applications – Evaluation of Arithmetic Expressions **(Unit 2).**
- **Quizzes -** BST and Binary Heap **(Unit 3).**
- **Tutorial problems-** Graph traversal **(Unit 4).**
- **Quizzes - Hashing and Sorting(Unit5) .**

Text Books(s):

1	"Data Structures and Algorithm Analysis in C", Mark Allen Weiss, 2nd Edition, Pearson Education, 2005
2	"Data Structures and Algorithm Analysis in C++ - Anna University, Mark Allen Weiss, Pearson Education, 2017.

Reference Books:

1	"Data Structures Using C and C++", Langsam, Augenstein and Tanenbaum, 2nd Edition, Pearson Education, 2015.

2	Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, Introduction to Algorithms", Fourth Edition, Mcgraw Hill/ MIT Press, 2022.

Description of Experiments (If applicable)	**60**
1	Implementation of Single Linked List (Insertion , Deletion and Display).
2	Implementation of Doubly Linked List (Insertion , Deletion and Display).
3	Implementation of Stack using Array and Linked List implementation.
4	Implementation of Queue using Array and Linked List implementation.
5	Implementation of Binary Search Tree and perform Tree Traversal Techniques.
6	Program to perform Quick Sort
7	Program to perform Merge Sort
8	Program to perform Linear Probing.
9	Program to perform Rehashing.
10	**Mini Project:** Contact book application using Linked List. Dictionary using Binary search trees. Snake Game. Chess Game. Travel Planner (Shortest Path Algorithm). Tic-Tac-Toe Game. Library Management System. Project Management System. other projects .

Web links for Theory & Lab	
1	Data Structures - GeeksforGeeks
2	Data Structures | DS Tutorial - javatpoint
3	Data Structure and Types (programiz.com)

CO - PO – PSO matrices of course

PO/PSO **CO**	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CS19241.1	1	2	1	2	1	-	-	-	-	-	-	1	1	2	-
CS19241.2	1	1	2	1	1	-	-	-	-	-	-	2	2	2	-
CS19241.3	1	1	2	1	1	-	-	-	-	-	-	2	2	2	-
CS19241.4	1	1	2	1	1	-	-	-	-	-	-	2	2	2	-
CS19241.5	1	1	2	1	1	-	-	-	-	-	-	1	1	2	-
Average	**1.0**	**1.2**	**1.8**	**1.2**	**1.0**	-	-	-	-	-	-	**1.6**	**1.6**	**2.0**	-

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation: “-“

Subject Code	Subject Name (Theory course)	Category	L	T	P	C
HS 23222	**Technical Communication II**	**HS**	**0**	**0**	**2**	**1**
Common to all branches of B.E/B. Tech programmes –Second Semester						

Objectives:
To facilitate students to improve their vocabulary for a better communication
To enable learners to understand and reproduce language
To aid students to write technical reports in a convincing manner
To expose students to different sentence structures
To equip learners to present their ideas in an efficient manner

UNIT-I	**VOCABULARY FOR BETTER COMMUNICATION**	6
Listening: Telephonic Conversations and TV News **Reading:** Newspapers and Magazines **Speaking**: Conversational Practice: Speaking in a given situation, Asking permission and requesting etc.., **Writing:** Job Application Letter and Resume **Grammar:** Reference words: pronouns and determiners **Vocabulary:** Guessing meanings of words in different contexts.		
UNIT-II	**FUNCTIONAL LANGUAGE ASPECTS**	6
Listening: Motivational listening – listening to real life challenges **Reading:** Articles and Technical reports **Speaking:** Using Polite Expressions, Indirect Questions **Writing:** Paraphrasing a Text, Poem **Grammar:** Purpose Statements, Cause and Effect Expressions **Vocabulary:** Neologisms.		
UNIT-III	**TECHNICAL REPORTWRITING**	6
Listening: Empathetic Listening – Giving Solutions to Problems **Reading:** Inferential Reading **Speaking:** Dialogues – Interviewing Celebrities / Leaders / Sportspersons, etc.., **Writing:** Report Writing **Grammar:** Functional Usage of Expressions – used to, gone / been, etc.., **Vocabulary:** Words Often Confused		

UNIT-IV	STRUCTURAL GRAMMAR	6
Listening: Comprehension (IELTS practice tests) **Reading:** Intensive Reading for specific information **Speaking:** Pick and Talk **Writing:** Proposals **Grammar:** Sentence Structures – Simple, Compound, Complex Sentences **Vocabulary:** Replacing dull words with vivid ones		
UNIT - V	**PRESENTATION SKILLS**	6
Listening: Discriminative listening – sarcasm, irony, pun, etc.., **Reading:** Practice of chunking – breaking up reading materials **Speaking:** Mini presentation on some topic **Writing:** Minutes of the meeting **Grammar:** Correction of Errors **Vocabulary:** Advanced vocabulary – fixing appropriate words in the given context.		
		Total Contact Hours: 30

Course Outcomes:
On completion of the course students will be able to
● communicate effectively using appropriate vocabulary
● use the acquired language skills to comprehend various types of language contents
● evaluate different texts and write effective technical content
● use appropriate sentence structures to convey their thoughts in varied contexts
● present their concepts and ideas in an effective manner

SUGGESTED ACTIVITIES

- Story Lines
- One truth and two lies
- Hang Man
- Pictionary
- Word Scramble
- Case study

SUGGESTED EVALUATION METHODS

- Assignment topics
- Quizzes
- Class Presentation/Discussion
- Continuous Assessment Tests

Text Book(s):

Raymond Murphy, "Intermediate English Grammar," Second Edition , Cambridge University Press, 2018

Meenakshi Raman &Sangeeta Sharma, "Technical Communication" Third Edition, Oxford University Press, 2015

Teaching Speaking: A Holistic Approach, Book by Anne Burns and Christine ChuenMengGoh, Cambridge University Press

Reference Books(s) / Web links:

1. Michael McCarthy (Author), Felicity O'Dell (Author), John D. Bunting (Contributor), "Basic Vocabulary in Use: 60 Units of Vocabulary Practice in North American English With Answers" 2nd Edition

2. Dale Carnegie, "The Art of Public Speaking," Insight Press

3. Jack C. Richards & Theodore S. Rodgers, " Approaches and Methods in Language Teaching, Second Edition,

Cambridge University Press

Subject Code	Subject Name	Category	L	T	P	C
HS 23223	English for Professional Competence	HS	0	0	2	1
Common to all branches of B.E/B. Tech programmes –Second Semester						

Objectives:

- To facilitate the learners in acquiring listening and reading competence
- To enable the learners to communicate effectively through written and oral medium
- To assist the learners in preparing for competitive examinations
- To train the students in acquiring corporate skills
- To inculcate professional standards among the students and make them realize their responsibility in addressing the challenges

UNIT-I	RECEPTIVE SKILLS	6
Listening – Comprehensive Listening – Watching the news – Listening to a peer giving presentation, etc. – Critical Listening – Watching a televised debate, Listening to poems – **Reading** – Extensive Reading – Short stories and One-act Plays – Intensive Reading – Articles or Editorials in Magazines, Blog posts on topics like science and technology, arts, etc.		
UNIT-II	**PRODUCTIVE SKILLS**	6
Speaking – Demonstrative Speaking – Process description through visual aids – Persuasive Speaking – Convincing the listener with the speaker's view – **Writing** – Descriptive Writing - Describing a place, person, process – Subjective Writing – Autobiography, Writing based on personal opinions and interpretations		
UNIT-III	**ENGLISH FOR COMPETITIVE EXAMS**	6
An introduction to International English Language Testing System (IELTS) – Test of English as a Foreign Language (TOEFL) – Graduate Record Examination (GRE) – Civil Service, Indian Economic Service Examination, Indian Statistical Service Examination, Combined Defence Services Examination, Staff Selection- (Language Related) – Aptitude tests.		
UNIT-IV	**CORPORATE SKILLS**	6
Critical Thinking and Problem Solving – Case Study, Brainstorming, Q & A Discussion – **Team work and Collaboration** – Activities like Office Debates, Perfect Square, Blind Retriever, etc. – **Professionalism and Strong Work Ethics** – Integrity, Resilience, Accountability, Adaptability, Growth Mind set		
UNIT-V	**PROJECT WORK**	6
Case Study based on the challenges faced by the employers and the employees – Devise Plan, Provide Solution		
	Total Contact Hours: 30	

Course Outcomes:

On completion of the course, students will be able to

- interpret and respond appropriately in the listening and reading contexts.
- express themselves effectively in spoken and written communication
- apply their acquired language skills in writing the competitive examinations
- exhibit their professional skills in their work place
- identify the challenges in the work place and suggest strategies solutions

SUGGESTED ACTIVITIES

- Online Quizzes on Vocabulary
- Online Quizzes on grammar
- Communication Gap Exercises
- Presentations
- Word Building Games
- Case study

SUGGESTED EVALUATION METHODS

- Assignment topics
- Quizzes
- Class
- Presentation/Discussion
- Continuous Assessment Tests

Reference Books

1	How to Read Better & Faster, Norman Lewis, Goyal Publishers
2	Teaching Speaking: A Holistic Approach, Book by Anne Burns and Christine Chuen Meng Goh, Cambridg University Press
3	The Official Cambridge Guide To IELTS by Pauline Cullen, Cambridge University Press
4	The 7 Habits of Highly Effective People by Stephen Covey, Simon and Schuster, UK

Reference Books(s) / Web links:

1. Board of Editors. Sure Outcomes. A Communication Skills Course for Undergraduate Engineers and Technologists. Orient Black Swan Limited, Hyderabad, 2013.

2. Hartley, Mary. "The Power of Listening," Jaico Publishing House; First Edition (2015).

3. Chambers, Harry. "Effective Communication Skills for Scientific and Technical Professionals," Persues Publishing, Cambridge, Massachusetts, 2000.

Subject Code	Subject Name (Laboratory Course)	Category	L	T	P	C
GE23121	ENGINEERING PRACTICES – Civil and Mechanical	ES	0	0	2	1

Objectives:

To provide exposure to the students with hands on experience on various basic engineering practices in Civil and Mechanical Engineering.

LIST OF EXPERIMENTS				
CIVIL ENGINEERING PRACTICE				
1.	Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, and elbows in household fittings.			
2.	Preparation of basic plumbing line sketches for wash basins, water heaters, etc.			
3.	Hands-on-exercise: Basic pipe connections – Pipe connections with different joining components.			
CARPENTRY WORKS:				
4.	Study of joints in roofs, doors, windows and furniture.			
5.	Hands-on-exercise: Woodwork, joints by sawing, planning and chiselling.			
MECHANICAL ENGINEERING PRACTICE				
6.	Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding.			
7	Gas welding practice.			
BASIC MACHINING:				
8	Simple Turning and Taper turning			
9	Drilling Practice			
SHEET METAL WORK:				
10	Forming & Bending:			
11	Model making – Trays and funnels			
12	Different type of joints.			
MACHINE ASSEMBLY PRACTICE:				
13	Study of centrifugal pump			
14	Study of air conditioner			
		Total Contact Hours	**:**	**30**

Course Outcomes:	
□	Able to perform plumbing activities for residential and industrial buildings considering safety aspects while gaining clear understanding on pipeline location and functions of joints like valves, taps, couplings, unions, reducers, elbows, etc.
□	Able to perform wood working carpentry activities like sawing, planning, cutting, etc. while having clear understanding of the joints in roofs, doors, windows and furniture.
□	Able to produce joints like L joint, T joint, Lap joint, Butt joint, etc. through arc welding process while acquiring in depth knowledge in the principle of operation of welding and other accessories
□	Able to perform operations like Turning, Step turning, Taper turning, etc. in lathe and Drilling operation in drilling machine
□	Able to perform sheet metal operations like Forming, Bending, etc. and fabricating models like Trays, funnels, etc.

TOTAL: 30 PERIODS

CO - PO – PSO matrices of course

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO 1	1	1	1	-	-	2	1	-	2	-	-	2	-	2	1
CO 2	1	1	1	-	-	2	1	-	2	-	-	2	-	2	1
CO 3	1	1	1	-	-	2	1	-	2	-	-	2	-	2	1
CO 4	1	1	1	-	-	2	1	-	2	-	-	2	-	2	1
CO 5	1	1	1	-	-	2	1	-	2	-	-	2	-	2	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Subject Code	Subject Name (Theory course)	Category	L	T	P	C
MC23112	**ENVIRONMENTAL SCIENCE AND ENGINEERING**	MC	**3**	**0**	**0**	**0**

Common to all branches of B.E./B.Tech. courses (Except B.Tech- CSBS)

Objectives:

To develop the understanding of environmental and associated issues

To develop an attitude of concern for the environment

To promote enthusiasm in participating environmental protection initiatives

To nurture skills to solve environmental degradation issues

UNIT-I	**Air and Noise pollution**	9

Definition –sources of air pollution –chemical and photochemical reactions in the atmosphere - formation of smog, PAN, acid rain, ozone depletion, particulate pollutants-Air quality standards-Air quality indices - control of particulate air pollutants-gravitational settling chambers, cyclone separators, wet collectors, fabric filters (Bag-house filter), electrostatic precipitators (ESP)-catalytic converters.

Noise pollution –sources - health effects - standards- measurement and control methods.

UNIT-II	**Water pollution and its management**	9

Definition-causes-effects of water pollution-point and nonpoint sources of wastewater-marine pollution - thermal pollution - Control of water pollution by physical, chemical and biological methods – wastewater treatment-primary, secondary and tertiary treatment-sources and characteristics of industrial effluents- zero liquid discharge.

UNIT-III	**Solid waste and Hazardous waste management**	9

Solid waste – types- municipal solid waste management: sources, characteristics, collection, and transportation- sanitary landfill, recycling, composting, incineration, energy recovery options from waste - Hazardous waste – types, characteristics, and health impact - hazardous waste management: neutralization, oxidation reduction, precipitation, solidification, stabilization, incineration and final disposal. E-waste-definition-sources-effects on human health and environment- E-waste management- steps involved - Role of E-waste management within the initiatives of the Govt. of India- Swachh Bharat Mission.

UNIT-IV	**Sustainable Development**	9

Sustainable development- concept-dimensions-sustainable development goals - value education- gender equality – food security - poverty – hunger - famine - Twelve principles of green chemistry - Green technology - definition, importance - Cleaner development mechanism - carbon credits, carbon trading, carbon sequestration, eco labeling- International conventions and protocols-Disaster management.

UNIT-V	**Environmental Management and Legislation**	9

Environmental Management systems - ISO 14000 series- Environmental audit-Environmental Impact Assessment- life cycle assessment- human health risk assessment - Environmental Laws and Policy-Objectives - Polluter pays principle, Precautionary principle - The Environment (Protection) Act 1986 - Role of Information technology in environment and human health.

	Total Contact Hours	**:**	**45**

Course Outcomes: On completion of the course, the students will be able to	
CO1	Associate air and noise quality standards with environment and human health.
CO2	Illustrate the significance of water and devise control measures for water pollution.
CO3	Analyze solid wastes and hazardous wastes.
CO4	Outline the goals of sustainable development in an integrated perspective.
CO5	Comprehend the significance of environmental laws.

Text Books:	
1	Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2016
2	Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers ,2018.
3	Johri R., E-waste: implications, regulations, and management in India and current global best practices, TERI Press, New Delhi

Reference Books	
1	R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media. 38. Edition 2010.
2	Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.
3	Fowler B, Electronic Waste – 1 st Edition (Toxicology and Public Health Issues), 2017Elsevier

Web links:	
1	https://onlinecourses.nptel.ac.in/noc19_ge22/
2	NPTEL
3	https://news.mit.edu/2013/ewaste-mit

CO - PO – PSO matrices of course

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
MC23112.1	1	2	3	1	-	2	2	2	1	1	1	2			
MC23112.2	1	2	3	1	-	2	2	2	1	1	1	2			
MC23112.3	-	-	3	1	-	2	3	2	1	-	1	2			
MC23112.4	-	1	2	1	1	3	3	2	1	1	1	2			
MC23112.5	-	1	2	-	-	2	2	2	1	2	2	2			
AVG.	0.4	1.2	2.6	0.8	0.2	2.2	2.4	2	1	1	1.2	2			

Note: Enter correlation levels 1, 2 or 3 as defined below:
1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Suggested activities

1. Case studies presentation

Method of evaluation

1. Classroom presentations on case studies
2. Site visits
3. CAT-I (or)CAT-II or CAT III

Course Code	Course Title	Category	L	T	P	C
MA23313	**DISCRETE MATHEMATICS FOR AI**	BS	**3**	**1**	**0**	**4**
Common to CSD, AIDS, AIML						

Objectives:
● To extend student's Logical and Mathematical maturity and ability to deal with abstraction.
● To provide discrete structures of many levels and to know the principle of counting.
● To provide the basic principles of sets and operations in sets and to Prove basic set equalities.
● To introduce the concept of Number Theory using axioms, definitions, examples, theorems and their proofs.
● To model problems in Computer Science and Engineering using graphs and trees.

UNIT-I	**MATHEMATICAL LOGIC**	**12**
Propositional calculus: Propositions and Connectives- Syntax: Semantics –truth tables – validity and satisfiability- Tautology – Connectives: Functionally complete set -Equivalence and normal forms - Formal reducibility– Predicates and quantifiers-Nested Quantifiers-Rules of inference – Temporal logic – Three valued logic.		
UNIT-II	**COMBINATORICS**	**12**
Basic counting sum and product- Balls and bins problems – Generating functions - Recurrence relations- Proof Techniques – Principle of Mathematical Induction - Pigeon hole principle.		
UNIT-III	**STRUCTURED SETS**	**12**
Set- Relation: Equivalence relations, Poset, Hasse diagram, Lattices - Boolean algebra –Algebraic System: Groups, Semi groups, monoid, homomorphism - Cosets and Lagrange's theorem-Rings and Fields (definition).		
UNIT-IV	**NUMBER THEORY**	**12**
Introduction - Divisibility - Primes - The binomial theorem-Congruences - Solutions of congruences - The Chinese - Remainder theorem - Techniques of numerical calculation.		
UNIT-V	**GRAPHS AND TREES**	**12**
Graph theory: Introduction to graphs- Graph isomorphism – Connectivity - Euler and Hamilton paths - Planar graphs - Trees –Properties- Distance and Centres – Types – Rooted Tree— Spanning Tree – Fundamental Circuits- Cut Sets – Properties – Connectivity - Separability - Graph coloring – Four color Theorem.		
Total Contact Hours: 60		

Course Outcomes:

On completion of the course, students will be able to

- Demonstrate the ability to write and evaluate a proof or outline the basic structure and give examples of each proof technique described.
- Apply counting principles to determine probabilities in engineering problems.
- Analyse the concepts and properties of algebraic structures in the solving complex engineering problems.
- Work effectively as part of a group to solve challenging problems in Number Theory.
- Use different traversal methods for trees and graphs arising in the field of engineering and technology.

SUGGESTED EVALUATION METHODS

- Problem solving in Tutorial sessions
- Assignment problems
- Quizzes and class test
- Discussion in classroom

SUGGESTED ACTIVITIES

- Problem solving sessions
- Visio for drawing graphs
- Online Calculators for PDNF and PCNF, recurrence relations and sets
- Online calculators for Logic gates
- GeoGebra for Hasse diagrams and graphs

Text Books:	
1	Elements of Discrete Mathematics, (Second Edition) C. L. LiuMcGraw Hill, New Delhi.
2	Digital Logic & Computer Design, M. Morris Mano, Pearson.
3	Rosen, K.H., "Discrete Mathematics and its Applications", 7th Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2011.
4	Tremblay, J.P. and Manohar.R, " Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2011.
5	Bressoud D., Wagon S., “A Course in Computational Number Theory”, Key College Publishing, New York, 2000.
Reference Books(s) / Web links:	
1	Introduction to linear algebra. Gilbert Strang.
2	Introductory Combinatorics, R. A. Brualdi, North-Holland, New York.
3	Graph Theory with Applications to Engineering and Computer Science, N. Deo, Prentice Hall, Englewood Cliffs.
4	Introduction to Mathematical Logic,(Second Edition), E. Mendelsohn, Van -Nostrand, London.
5	Graph Theory with Applications, J. A. Bondy and U. S. R. Murty, Macmillan Press, London.
6	Mathematical Logic for Computer Science,L. Zhongwan, World Scientific, Singapore.
7	Topics in Algebra, I. N. Herstein, John Wiley and Sons.

Subject Code	Subject Name (Lab oriented Theory Course)	Category	L	T	P	C
CD23331	Design Processes & Perspectives	PC	3	0	2	4

Objectives:

- Understand design thinking for visual communication
- Understanding to decide on visual compositions
- Learn the concepts to communicate created design
- Understand the Media Design and Digital Image Printing
- Learn the concepts of Design for Interactive Media.

UNIT – I	Design thinking for Graphics	**7**

Role of Graphic Design in Society-Elements of Graphic design: Basic elements-relational lements- Intentional Elements– Principles of Graphic Design-Implications and Impact of Graphic Design –Graphic Design Process: Design thinking Definition – Design thinking stages

UNIT – II	Inspecting and deciding visual elements for design thinking	**10**

Define the problem – Research the problem: Identifying drivers - Information gathering-Target groups – Idea Generation for the problem - Basic design directions-Questions and answers-Themes of thinking - Brainstorming- Deciding elements to design - Sketching and Drawing - Lines, shapes, Negative space/white space, Volumes, Value, Color, Texture- Color: Color Theories-Color wheel - Color Harmonies or Color Schemes- Color Symbolism – Font - Layout

UNIT – III	Refinement and prototyping design	**8**

Refinement of Design : Thinking in images - Thinking in signs - Appropriation - Humor- Personification - Visual metaphors - Modification - Thinking in words- Thinking in technology – Prototyping - Developing designs - 'Types' of prototype- Vocabulary – Risk management – Implementation: Format - Materials- Finishing – Case study

UNIT – IV	Media and Digital Image Printing	**10**

Digital Imaging and Printing - Advertising Design - Integrated Methods of Advertising -Visuals and Their Voice in Advertising - The Stages of Advertising Design - Logo, and Package Development - Campaign Design–Newspaper Design: Newspaper's Role in Modern Advertising: When to Use Newspaper - The Effect of Newsprint on Design- Sizing Up Newspaper Columns -Say and look of newspaper - Magazine Design

UNIT – V	Graphic Design for Interactive Media	**10**

Graphic Design for Interactive Media - Graphic Design approach - The Design Components That Make Up a Website -

Breaking Down the Parts of a Website - Elements to develop website -Designing with HTML- Creating a simple page – Marking up text and tables – Adding links and images – Creating Forms - Basic concept of CSS: Introduction- Formatting text-colors-background – Responsive Web Design – Web Image Basics – SVG

	Contact Hours	**:**	**45**

List of Experiments				
Design the given experiments using five phases of design thinking principles. (Max 4 people in a group). Implement various Font, Color, Layout and Typographic design elements in each experiment.				
1	Design an UI that can teach mathematics to children of 4-5 years age in school in Rural sector.			
2	Design an UI that can help people to sell their handmade products in metro cities.			
3	Design an UI for a social media website and chat.			
4	Design a publication that support different languages.			
5	Design a publication that tells comic stories			
6	Design an advertisement for mobile company			
7	Design an advertisement for any political party with images			
8	Design an advertisement for electronic products			
9	Design an advertisement for food products			
10	Design an Interactive website for a new Institution.			
11	Design a Blog that publish educational posts.			
12	Design an interactive website for hospital management system.			
13	Design an interactive website for food selling app.			
		Contact Hours	**:**	**30**
		Total Contact Hours	**:**	**75**
Course Outcomes: On completion of the course students will be able to:				
●	Understand the various graphic design thinking process and phases			
●	Analyse and choose between various visual compositions			
●	Designing and communicating visual components			
●	Apply design concepts for media publishing and advertisement			
●	Create website using different design concepts			
LAB EQUIPMENT:				
1	**Hardware Requirements:** Intel® or AMD processor with 64-bit support; 2 GHz or faster processor with SSE 4.2 or later - 8 GB RAM - Windows 10 64-bit (version 1909) or later - 1.5 GB of GPU memory-4 GB of available hard-disk space;			
2	**Software Requirements:** Adobe Photoshop – Adobe Illustrator – HTML – CSS			

Text Book(s):	
1	Design Thinking for Visual Communication, Gavin Ambrose, Bloomsbury Publishing, Edition 1, 2017
2	Advertising Design by MediumA Visual and Verbal Approach, Robyn Blakeman, Taylor and Francis, Edition 1 , 2022
3	Learning Web Design,Jennifer Niederst Robbins, O' Reilley, 5th Edition,2018

Reference Book(s):	
1	David Raizman; History of Modern Design, Prentice Hall,2004
2	Handbook of Design Thinking, Christian Mueller-Roterberg, Amazon kindle, 2018

Web links for Theory & Lab:	
1.	https://www.aicte-india.org/sites/default/files/bvoc/Graphics%20&%20Multimedia.pdf
2.	https://www.interaction-design.org/literature/topics/visual-design https://www.interaction-design.org/literature/topics/de-thinking
3,	https://ncert.nic.in/textbook.php?kegd1=1-8 https://ncert.nic.in/textbook.php? legd1=0-12

CO-PO-PSO matrices of course

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CD19341.1	3	1	3	2	3	2	3	1	1	1	1	3	1	3	1
CD19341.2	3	-	3	-	3	-	-	-	-	-	1	1	1	3	1
CD19341.3	3	3	3	2	3	-	-	-	-	-	-	1	1	3	2
CD19341.4	1	3	3	3	3	3	2	2	2	2	2	2	1	3	3
CD19341.5	1	3	3	3	3	3	2	2	2	2	2	2	1	3	3
Average	**2.2**	**2**	**3**	**2**	**3**	**1.6**	**1.4**	**1**	**1**	**1**	**1.2**	**1.8**	**1**	**3**	**2**

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation: "-"

Subject Code	Subject Name (Lab Oriented Theory course)	Category	L	T	P	C
CS23331	Design and Analysis of Algorithms	PC	3	0	2	4

Objectives:	
●	Learn and understand the algorithm analysis techniques and complexity notations
●	Become familiar with the different algorithm design techniques for effective problem solving in computing.
●	Learn to apply the design techniques in solving various kinds of problems in an efficient way.
●	Understand the limitations of Algorithm power.
●	Solve variety of problems using different design techniques

UNIT I	INTRODUCTION TO ANALYSIS OF ALGORITHMS AND EXHAUSTIVE SEARCH	9
Introduction- Algorithm–Fundamentals of Algorithmic Problem Solving-Analysis: Space Complexity - Time Complexity: Counter method, Mathematical Analysis of non-recursive algorithms- Asymptotic Notations - Using Limits for Comparing Orders of Growth – Basic Efficiency Classes-Brute Force Technique-Exhaustive Search-Travelling Salesperson Problem-Knapsack Problem		
UNIT II	**RECURRENCE RELATION AND GREEDY TECHNIQUE**	10
Mathematical Analysis of Recursive algorithms -Recurrence Relation-Solving Recurrence Relations: Substitution methods and Master Theorem Method. Greedy Method – Minimum Spanning Trees: Kruskal's Algorithm– Fractional Knapsack - Huffman Codes-Activity Selection Problem.		
UNIT-III	**DIVIDE AND CONQUER TECHNIQUE**	7
Divide and Conquer Method-Introduction-Binary Search-Finding Min Max-Maximum Subarray Problem-Towers of Hanoi Problem-Finding the kth element-Analysis of Quick and Merge Sort.		
UNIT IV	**DYNAMIC PROGRAMMING TECHNIQUE**	9
Dynamic Programming-Rod Cutting-Longest Common Subsequence-Traveling Sales Person Problem-String Editing- Longest Common Substring-Longest non-decreasing subsequence-Stair Case Problem.		
UNIT-V	**BACKTRACKING BRANCH AND BOUND AND NP COMPLETE & NP HARD**	10
Backtracking-Graph Coloring-n Queen's Problem-Branch and Bound-Knapsack Problem-- NP Complete and NP Hard Problems: Basic Concepts - Non-Deterministic Algorithms - Class of NP Complete and NP Hard Problems- Approximation Algorithm- TSP.		
	Total Contact Hours :	45

	List of Experiments	
1	Finding Time Complexity of algorithms	
2	Design and implement algorithms using Divide and Conquer Technique	
3	Design and implement algorithms using Greedy Technique	
4	Design and implement algorithms using Dynamic Programming	
5	Competitive Programming-Certain Techniques	
Contact Hours :		30
Total Contact Hours :		75

Course Outcomes:	
On completion of course you will be able to	
●	Analyse the time and space complexity of various algorithms and compare algorithms with respect to complexities.
●	Decide and apply Divide and Conquer design strategy to Synthesize algorithms for appropriate computing problems.
●	Decide and Apply Greedy technique to Synthesize algorithms for appropriate computing problems.
●	Decide and Apply Dynamic Programming technique to Synthesize algorithms for appropriate computing problems.
●	Decide and Apply Backtracking and Branch and Bound techniques to Synthesize algorithms for appropriate computing problems.
Suggested Activities:	
●	Complexity Analysis Exercises: Assign exercises where students practice calculating the space and time complexity of given algorithms using the counter method and mathematical analysis
●	Asymptotic Notations Quiz: Organize quizzes focusing on understanding and applying asymptotic notations to compare algorithm efficiency.
●	Greedy technique and Divide and Conquer Technique-Problem-Solving Contests-Host contests where students solve problems like the activity selection problem using greedy techniques, encouraging competitive learning.
●	Dynamic Programming-Case Studies on Optimization Problems-Discuss in-depth various optimization problems solved using dynamic programming, highlighting the strategy and solution steps.
●	Approximation Algorithm Projects: Assign projects where students explore and implement approximation algorithms for problems

Textbooks:	
●	Anany Levitin, “Introduction to the Design and Analysis of Algorithms”, Third Edition, Pearson Education, 2012.
●	Ellis Horowitz, Shani, Sanguthevar Rajasekaran, "Computer Algorithms" Universities Press, Second Edition 2008.
	Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, “Introduction to Algorithms”, Third Edition, PHI Learning Private Limited, 2012.

Reference Books (s)/Web links:	
1.	Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, “Data Structures and Algorithms”, Pearson Education, Reprint 2006.
2.	Donald E. Knuth, “The Art of Computer Programming”, Volumes 1& 3 Pearson Education, 2009.
3.	Sara Baase Allen Van Gelder, "Computer Algorithms - Introduction to Analysis" Pearson Education Asia, 2010
4.	https://www.geeksforgeeks.org/fundamentals-of-algorithms/
5.	https://www.hackerrank.com/domains/algorithms

Subject Code	Subject Name(Lab Integrated Theory course)	Category	L	T	P	C
CD23332	**UI and UX**	PE	2	0	4	4

Objectives:

- To learn the fundamentals of User Interface Design.
- To learn the fundamentals of User Design Elements.
- To study the principles of heuristic evaluation for interactive design.
- To familiarize the facets of User Experience (UX) Design, particularly as applied to the digital artifacts.
- To understand the appreciation of user research, solution conceptualization andvalidation as interwoven activities in the design and development lifecycle of a product.

UNIT-I	**THE USER INTERFACE— AN INTRODUCTION AND OVERVIEW**	**6**

Basics of User Interface-Importance of User Interface-Principles of UI-User Interface Design Process-Understand the Principles of Good Design: What screen user wants, what screens users do, Interface Design Goals-Technological Considerations in Interface Design, User Centered Design Basics.

UNIT-II	**THE USER INTERFACE DESIGN ELEMENTS**	**6**

Introduction to Menus: Structure of Menus, Functions of Menus, Contents of Menus, Formatting of Menus, Selecting and Navigating Menus, Kinds of Graphical Menus-Windows: Window Characteristics, Types of windows, window Management, Organizing Window Functions-Device and Selection-Based Controls.

UNIT-III	**EVALUATION OF INTERACTIVE DESIGN**	**6**

Introduction to Interactive Design process – Interactive design in practice – Introducing evaluation – Evaluation:

Inspection, Methods, Usability in Design, Analysis and Models – Inspection: Heuristic Evaluation: 10 Heuristic Principles, Examples – Case study: A Heuristic Evaluation of Big basket application.

UNIT-IV	**INTRODUCTION TO USER EXPERIENCE**	**6**

Basics of UX design Process-Elements of UX-Design Thinking Techniques: Scenarios, Brainstorming, Design Tools- Techniques for Contextual Enquiry, User Interviews, Competitive Analysis for UX, Wire-Framing and Prototyping

Techniques

UNIT-V	**UX RESEARCH TECHNIQUES**	**6**

Research planning: Goals of Research, The Format of the plan-Competitive Research: Methods, Focus Groups, Card Sorting, Usability testing, Iterative Product Development, Concept Development - User review and Feedback, UX

Case study of Sport360.fit app

	Total Contact Hours	**:**	**30**

List of the Experiments			
1. Develop and design a mobile or web application to change background color and menus.			
2. Redesign canteen menu to increase the ease of use and ease of functionality (Grid and Menu Views)			
3. Heuristic Evaluation: Group Assignment initiation (Website and App) Evaluation for key tasks of the app or website for heuristic principles, severity, recommendations.			
4. Students will identify a project in the given domain (Healthcare, E-Commerce, Online Learning Platforms, Gaming, Booking, Music) and its related website or mobile app to redesign. They will take this redesign project through the design lifecycle: Discovery Define Design Implement (Design Prototype) Usability Testing The below design methods and techniques will be imparted w.r.t. the group project selected by the students.			
5. Persona Creation for the group project			
6. Task flow detailing for the project.			
7. Project Prototyping Iteration 1 and 2.			
8. Pick your favourite design agency. Redesign their contact page in a more user-friendly way.			
	Contact Hours	**:**	**30**
	Total Contact Hours	**:**	**60**

Course Outcomes: On completion of the course, the students will be able to
● Understand the fundamentals and importance of User Interface Design.
● Learn and able to design the fundamentals of User Design Elements
● Perform design evaluation by applying the heuristic principles.
● Develop an application focusing on the design aspects based on the user Experience.
● Understanding research on user requirements and Iterative Product Development.

Text Book(s):
1. Wilbent. O. Galitz ,"The Essential Guide To User Interface Design", John Wiley & Sons,2nd Edition, 2001.
2. Jenny Preece, Helen Sharp and Yvonne Rogers, "Interaction Design: Beyond Human-Computer Interaction", 3rd Edition, 2004.
3. Jesse James Garrett, The Elements of User Experience: User-Centered Design for the Web and Beyond, 2nd Edition, 2010.
Reference Books(s) / Web links:
● Alan Cooper and Robert Reimann, "About Face", John Wiley, 4th Edition.
● Elizabeth Goodman, Mike Kuniavsky, Andrea Moed, "Observing the User Experience: A Practitioner's Guide to User Research", 2nd Edition, 2012.
● Jonny Schneider, "Understanding Design Thinking, Lean, and Agile", 1st Edition, 2020.
Web links for virtual lab (if any)
● https://uxdesign.cc/designing-better-links-for-websites-and-emails-a-guideline-5b8638ce675a
● https://bootcamp.uxdesign.cc/100-weblinks-for-ux-ui-designers-31884d1f0140
● https://www.tutorialspoint.com/mobile-ui-and-ux-design/index.asp

CO-PO– PSO matrices of course

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CD19P05.1	2	2	2	2	2	1	1	1	3	1	3	2	3	2	3
CD19P05.2	2	3	3	3	3	2	2	2	3	2	3	2	3	3	3
CD19P05.3	1	3	3	3	3	2	3	2	2	2	3	2	3	3	3
CD19P05.4	3	3	3	3	3	3	2	2	2	2	3	2	2	2	2
CD19P05.5	2	3	3	2	2	2	2	2	2	2	3	2	3	2	3
Average	2	2.8	2.8	2.6	2.6	2	2	1.8	2.4	1.8	3	2	2.8	2.4	2.8

Correlation levels1,2 or3areasdefinedbelow:

1:Slight (Low) 2: Moderate (Medium)3: Substantial (High)Nocorrelation:"-"

Subject Code	Subject Name (Lab Oriented Theory course)	Category	L	T	P	C
CS23332	Database Management Systems	PC	3	0	4	5

Objectives:	
•	Understand the role of a database management system and construct simple and moderately advanced database queries using Structured Query Language (SQL).
•	Apply logical database design principles, including E-R diagrams, Relational Algebra, Tuple Relational calculus Representation and Query Processing
•	Know the importance of functional dependency and normalization, and what role it plays in the database design process and File Organization.
•	Understand the concept of a database transaction including concurrency control, backup and recovery, and data object locking and handling deadlocks.
•	Work with the foundation for No SQL technologies and web page designing

UNIT I	DATABASE SYSTEMS AND SQL QUERY	9
Introduction – Purpose of Database Systems - View of Data –Database Architecture -Database Schema – Keys – Codd's Rule –RDBMS- SQL: Data Definition – Domain types – Structure of SQL Queries - Modifications of the database – Set Operations – Aggregate Functions – Null Values- SQL Nested Subqueries – Complex Queries – Views – Joined relations – Complex Queries.		
UNIT II	**PL/SQL, DATA MODEL AND QUERY PROCESSING**	**9**
PL/SQL: Functions, Procedures, Triggers, Cursors –Dynamic SQL–Relational Algebra-Tuple Relational calculus- Domain Relational Calculus– Entity Relationship Model – Constraints -Entity Relationship Diagram - Design Issues of ER Model – Extended ER Features – Mapping ER Model to Relational Model– Query Processing – Heuristics for Query Optimization.		
UNIT-III	**NORMAL FORMS AND INDEXING**	**9**
Motivation for Normal Forms – Functional dependencies – Armstrong's Axioms for Functional Dependencies – Closure for a set of Functional Dependencies – Definitions of 1NF-2NF-3NF and BCNF – Multivalued Dependency 4NF - Joint Dependency- 5NF-File Organization-Indexing B+ tree ,B-Tree		
UNIT IV	**TRANSACTIONS**	**9**
Transaction Concepts – ACID Properties – Schedules – Serializability – Transaction support in SQL – Need for Concurrency – Concurrency control –Two Phase Locking- Timestamp – Multiversion – Validation and Snapshot isolation– Multiple Granularity locking – Deadlock Handling – Recovery Concepts – Recovery based on deferred and immediate update – Shadow paging – ARIES Algorithm.		
UNIT-V	**NOSQL DATABASE**	**9**
NoSQL Database vs.SQL Databases – CAP Theorem –Migrating from RDBMS to NoSQL – MongoDB – CRUD Operations– MongoDB Sharding – MongoDB Replication – Web Application Development using MongoDB with Python and Java.		
	Total Contact Hours :	**45**

	List of Experiments	
1	Installation of Sleuth Kit on Linux. List all data blocks. Analyze allocated as well as unallocated blocks of a disk image.	
2	Data extraction from call logs using Sleuth Kit.	
3	Data extraction from SMS and contacts using Sleuth Kit.	
4	Extract installed applications from Android devices.	
5	Extract diagnostic information from Android devices through the adb protocol.	
6	Generate a unified chronological timeline of extracted records,	
7	Implement the sql query database and to handle sqlite in browser	
8	Hide Invisible Secrets in the initial screen using Steganography	
	Contact Hours:	**30**
	Total Contact Hours:	**75**
Course Outcomes: On completion of course you will be able to		
●	Understand the use of the Relational model and apply SQL Queries	
●	Apply Pl/SQL, Dynamic SQL, understand the representation of Relational Algebra, Calculus and Query Processing	
●	Understand the concept of normalization, Indexing and apply as a case study	
●	Understand concurrency control and recovery mechanisms.	
●	Use MongoDB NoSQL Database to Maintain Data of an Enterprise	
Textbooks:		
●	Abraham Silberschatz, Henry F. Korth and S. Sudharshan, “Database System Concepts”, Seventh Edition, Mc Graw Hill, March 2019.	
●	P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2013.	
Reference Books (s)/Web links:		
1.	Ramez Elmasri and Shamkant B. Navathe, “Fundamentals of Database Systems”, Seventh Edition, Pearson Education, 2016.	
2.	C.J.Date, A.Kannan and S.Swamynathan, “An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.	
3.	Atul Kahate, “Introduction to Database Management Systems”, Pearson Education, New Delhi, 2006.	
4.	Steven Feuerstein with Bill Pribyl,”Oracle PL/SQL Programming”,sixth edition, Publisher: O'Reill 2014.	
5.	MongoDB: The Definitive Guide, 3rd Edition,by Kristina Chodorow, Shannon Bradshaw,Publisher: O'ReillYMedia,2019	
6.	ShashankTiwari,” Professional NoSQL”, Wiley, 2011.	
7.	David Lane, Hugh.E.Williums, Web Database Applications with PHP and MySQL, O’Reilly Media; 2nd edition, 2004	

Subject Code	Subject Name (Laboratory Course)	Category	L	T	P	C
CD23321	PYTHON PROGRAMMING FOR DESIGN	PC	0	0	4	2

Course Objectives:

- To understandcomputers, programming languages and their generations and essential skills for a logical thinking for problem solving.
- To write, test, and debug simple Python programs with conditionals, and loops and functions
- To develop Python programs with defining functions and calling them
- To understand and write python programs with compound data- lists, tuples, dictionaries
- To search, sort, read and write data from/to files in Python.

List of Experiments

1.	Introduction to Python : Variables, Operators and IOOperations.
2.	Selection control structures.
3.	Iteration control structures.
4.	Strings
5.	List and Tuples
6.	Sets and Dictionary
7.	Experiments on functions.
8.	Experiments based on Files.
9.	Experiments based on Packages: numpy, pandas, flask
10.	Design based experiments with PyTorch
11.	Design based experiments with tknitter

Contact Hours : 60

Course Outcomes:

On completion of the course, students will be able to:

- Understand the working principle of a computer and identify the purpose of a computer programming language and ability to identify an appropriate approach to solve the problem.
- Write, test, and debug simple Python programs with conditionals and loops.
- Develop Python programs step-wise by defining functions and calling them.
- Use Python lists, tuples, dictionaries for representing compound data.
- Apply searching, sorting on data and efficiently handle data using flat files.

LAB EQUIPMENT:

1	**Hardware**: Standalone desktops with minimum desktop configuration.
2	**Software**: System loaded with windows or Linux to run Python, Pytorch and related packages.

CO - PO – PSO matrices of course

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CD19411.1	2	2	2	2	1	-	-	-	1	1	1	1	3	3	-
CD19411.2	2	1	1	1	1	-	-	-	-	-	1	1	3	2	-
CD19411.3	1	1	2	1	2	-	-	-	-	-	1	1	2	3	2
CD19411.4	2	2	3	2	2	-	-	-	-	-	2	1	2	2	2
CD19411.5	2	2	3	2	3	-	-	-	-	-	2	1	2	2	2
Average	**1.8**	**1.6**	**2.2**	**1.6**	**1.8**	**-**	**-**	**-**	**1**	**1**	**1.4**	**1**	**2.4**	**2.4**	**2**

Note: Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Course Code	Course Title	Category	L	T	P	C
MA23433	**MATHEMATICAL MODELLING AND SIMULATION**	**BS**	3	0	2	4
IV Sem. B.E. – Computer Science and Design						

Objectives:
● To introduce modelling and simulation and how to model, solve and interpret real life problems using different Mathematical perspectives.
● To formulate and solve different models in dynamic programming problem.
● To construct a mathematical model for a non-linear programming problem in real life situation using Lagrangian and Kuhn- Tucker methods.
● To build appropriate simulation models together with their parameterization and the analysis of simulator output data.
● To construct and analyse models using Markov Chains

UNIT-I	**INTRODUCTION TO MODELLING**	**9**
Discrete mathematical model formulation: Introduction to constrained linear optimization - Convex sets, Convex function- solution by graphical and simplex methods - Primal-Penalty-Introduction to discrete probabilistic modeling.		
UNIT-II	**MODELLING OF DYNAMIC SYSTEMS**	**9**
Recursive nature of computations in Dynamic Programming – Forward and Backward recursion – Applications: Cargo loading model, workforce size model, Investment model, Equipment replacement model – Problem of dimensionality.		
UNIT-III	**MODELLING OF NON-LINEAR SYSTEMS**	**9**
Unconstrained external problems: Newton – Raphson method – Equality constraints – Jacobian methods – Lagrangian method – Kuhn – Tucker conditions – Simple problems.		
UNIT-IV	**SIMULATION MODELLING**	**9**
Monte-Carlo simulation – types of simulation – Elements of discrete event simulation – random number generation – methods of gathering statistical observation - simulation languages.		
UNIT-V	**FUNDAMENTALS OF TRANSITION BASED SIMULATION**	**9**
Markov Process – Discrete Parameter Markov chain – Chapman Kolmogorov theorem (without proof) - State transitions- state probabilities - properties – steady state analysis – absorbing chains – Case study : Markov Analysis of Dynamic memory allocations, Markov models for manufacturing production capability.		
Total Contact Hours: 45		

S.No	**List of Experiment (using Python Software)**	**Total Contact Hours: 30**

1	Basic Functions in Python
2	Linear programming problem -using the PuLP library
3	Transportation problem -Optimal cargo shipping problem
4	Assignment Problem-Assignment with team of workers-Assignment with task size
5	Dynamic programming – Knapsack problem, Subset sum problem, longest common subsequence problem
6	Unconstrained Optimization- Nonlinear Least squares
7	Kuhn-Tucker conditions - Lagrangian Multiplier method
8	Simulating Queuing system with Python-M/M/1 model
9	Monte Carlo simulation -Coin flip problem and Monty hall problem
10	Markov chains analysis – generating Markov sequence, steady state distribution -Hidden Markov model – airport check in problem

Course Outcomes:

On completion of the course, students will be able to

- Construct modelling and simulation and interpret real life problems using different Mathematical perspectives.
- Solve dynamic programming problems arising in engineering and technology.
- Use analytic solution methods like Lagrange's and Kuhn Tucker conditions to solve non-linear programming models.
- Build appropriate simulation models together with their parameterization and the analysis of simulator output data in engineering problem analysis.
- Characterize features of a Markov model and analyse different systems which are time dependent.

SUGGESTED ACTIVITIES

- Problem solving sessions
- Smart Class room sessions

SUGGESTED EVALUATION METHODS

- Problem solving in Tutorial sessions
- Assignment problems
- Quizzes and class test
- Discussion in classroom

Reference Books(s) / Web links:	
1.	Jerry Banks, John S Carson II, Barry L. Nelson and David M, Discrete-Event System Simulation, Nicol, 3 edition, PHI/Pearson Education.
2.	M. W. Carter, C. C. Price and G. Rabadi, “Operations research a practical introduction ” second edition, 2019. CRC Press.
3.	Frederick S Hiller and Gerald J Lieberman, Introduction to Operations Research, 7 Edition, Tata McGraw Hill, 2001.
4.	Averil M Law, Simulation Modeling and Analysis ,TMH, 2013.

Text Book(s):	
1.	Hamdy A Taha, Operations Research: An Introduction, Prentice Hall India, Tenth Edition, 2019.
2.	Hwei Hsu, “Schaums Outline of Theory and Problems of Probability, Random Variables and Random Processes”, Tata Mcgraw Hill Edition, New Delhi, 1997.
3.	Al-Begain. H., and Bargiela, A., Eds., “Seminal Contributions to Modelling and Simulation.” Springer, 2016.
4.	Frank R. Giordano, William P. Fox, Steven B. Horton, “A First Course in Mathematical Modeling”, Cengage learning 2013.

Subject Code	Subject Name (Lab Oriented Theory Course)	Category	L	T	P	C
AI23231	PRINCIPLES OF ARTIFICIAL INTELLIGENCE	PC	3	0	2	4

Objectives:	
•	Understand the various characteristics of a problem solving agent
•	Learn about the different strategies involved in problem solving
•	Learn about solving problems with various constraints.
•	Apply A.I to various applications like expert systems etc.
•	Understand the different models of learning

UNIT-I	Introduction to Artificial intelligence and Problem-Solving Agent	9
Problems of AI, AI technique, Tic – Tac – Toe problem. Intelligent Agents, Agents & environment, nature of environment, structure of agents, goal-based agents, utility-based agents, learning agents. Defining the problem as state space search, production system, problem characteristics, issues in the design of search programs.		
UNIT-II	**Search techniques**	**9**
Problem solving agents, searching for solutions; uniform search strategies: breadth first search, depth first search, depth limited search, bidirectional search, comparing uniform search strategies. Heuristic search strategies Greedy best -first search, A* search, AO* search, memory bounded heuristic search: local search algorithms & optimization problems: Hill climbing search, simulated annealing search, local beam search.		
UNIT-III	**Constraint satisfaction problems and Game Theory**	**9**
Local search for constraint satisfaction problems. Adversarial search, Games, optimal decisions & strategies in games, the minimax search procedure, alpha-beta pruning, additional refinements, iterative deepening.		
UNIT-IV	**Knowledge & reasoning**	**9**
Statistical Reasoning: Probability and Bays‟ Theorem, Certainty Factors and Rule-Base Systems, Bayesian Networks, Dempster-Shafer Theory, Fuzzy Logic. AI for knowledge representation, rule-based knowledge representation, procedural and declarative knowledge, Logic programming, Forward and backward reasoning.		
UNIT-V	**Introduction to Machine Learning**	**9**
Exploring sub-discipline of AI: Machine Learning, Supervised learning, Unsupervised learning, Reinforcement learning, Classification problems, Regression problems, Clustering problems, Introduction to neural networks and deep learning.		
	Contact Hours :	**45**

List of Experiments

1	**Programs on Problem Solving**			
a	Write a program to solve 8 Queens problem.			
b	Solve any problem using depth first search.			
c	Implement MINIMAX algorithm.			
d	Implement A* algorithm			
2	**Programs on Decision Making and Knowledge Representation**			
a	Introduction to PROLOG			
b	Implementation of Unification and Resolution Algorithm.			
c	Implementation of Backward Chaining			
d	Implementation of Forward Chaining			
3	**Programs on Planning and Learning**			
a	Implementation of Blocks World program			
b	Implementing a fuzzy inference system			
c	Implementing Artificial Neural Networks for an application using python			
d	Implementation of Decision Tree			
e	Implementation of K-mean algorithm			
		Contact Hours	**:**	**30**
		Total Contact Hours	**:**	**75**

Lab Specifications:

- The lab can be implemented using Python or C.
- Knowledge representation experiments can be performed using a PROLOG TOOL.

Course Outcomes:

On completion of the course, the students will be able to

□□	Basic knowledge representation, problem solving, and learning methods of artificial intelligence.
□□	Provide the apt agent strategy to solve a given problem
□□	Represent a problem using first order and predicate logic
□□	Design applications like expert systems and chat-bot.
□□	Suggest supervised, unsupervised or semi-supervised learning algorithms for any given problem

Text Books(s):	
1	S. Russell and P. Norvig, Artificial Intelligence: A Modern Approach, Prentice Hall, Third Edition, 2015.
2	Nils J. Nilsson, Artificial Intelligence: A New Synthesis (1 ed.), Morgan-Kaufmann, 1998. ISBN 978-1558605350.

Reference Book(s) / Web link(s):	
1	Elaine Rich, Kevin Knight, &Shivashankar B Nair, Artificial Intelligence, McGraw Hill, 3rd ed.,2017.
2	Introduction to Artificial Intelligence & Expert Systems, Patterson, Pearson, 1st ed. 2015
3	Logic & Prolog Programming, Saroj Kaushik, New Age International, Ist edition, 2002.
4	Expert Systems: Principles and Programming,11 March 1998. Edition: 4th. ISBN: 9788131501672

CO - PO – PSO matrices of course

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
AI19341.01	3	3	1	-	2	1	1	1	1	-	2.2	1	2	1	1
AI19341.02	2	2	1	-	2	1	2	-	-	-	2	2	1	1	1
AI19341.03	3	3	1	-	3	-	1	-	-	-	3	1	2	3	2
AI19341.04	2	3	-	-	2	1	1	1	-	-	2	2	2	2	3
AI19341.05	2	2	2	2	3	-	1	2	-	-	3	3	3	3	3
Average Mapping	**2.4**	**2.4**	**1.25**	**2.0**	**2.4**	**1.5**	**1.2**	**1.3**	**1.0**	**-**	**2.4**	**1.8**	**2.0**	**2.0**	**2.0**

Note: Enter correlation levels 1, 2 or 3 as defined below:
1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Subject Code	**Subject Name (Lab Oriented Theory course)**	**Category**	**L**	**T**	**P**	**C**

CS23432	Software Construction	PC	3	0	2	4

Objectives:	
●	Students can gain a comprehensive understanding of Azure's infrastructure, including virtual machines, networking, storage, and security services, to effectively deploy and manage software applications.
●	Students can learn cloud-native development practices and principles, leveraging Azure services such as Azure App Service, Azure Functions for building scalable and resilient software solutions.
●	Students can explore CI/CD pipelines using Azure DevOps, GitHub Actions, or Azure Pipelines to automate the build, test, and deployment processes, ensuring rapid and reliable software delivery.
●	Students can develop skills in monitoring and diagnostics using Azure Monitor and Application Insights, enabling proactive identification and resolution of performance issues and errors in software applications.
●	**S**tudents can understand security best practices for software construction in Azure, including identity and access management (IAM), data encryption, network security to build secure and compliant software solutions.

UNIT I	INTRODUCTION TO SOFTWARE ENGINEERING	9
Software Process-Requirements to Maintenance-Perspective and Specialized Process Models-Projects on On-Prem/On Cloud (Azure, AWS, GCP)-Projects on cloud (cloud providers AWS, Azure)-Agile methods with associated metrics- Software metrices -AI and Data Science -Software Security- DevOps /DevSecOps.		
UNIT II	**SOFTWARE REQUIREMENTS**	9
How to do Requirements in Agile-Understand Themes, Epic, Features, User Stories and Tasks-How to identify Themes, Epics, Features, User Stories-How to document the same in Microsoft Azure Boards-How to use Poker Planning Estimation Technique -Non Functional Requirements - its purpose, different attributes of the same, and examples - Document the same in Microsoft Azure Boards.		
UNIT-III	**SYSTEM MODELING**	9
System Modeling-Context Model-Interaction Model-Interaction Model-Structural Model-Behavioral Model-Architectural patterns-Architectural patterns-continuation-Data Flow Diagrams-ER Diagram- Tools Practice (Azure) -Prototypes / MVP.		
UNIT IV	**TESTING**	9
Testing Using AZURE-AZURE Test Plan Preparation-Manual and Exploratory Testing-Automated Testing-Traceability-Reporting and Analysis.		
UNIT-V	**SOFTWARE CONFIGURATION MANAGEMENT**	9
Software Configuration Management-Introduction-Tools for SCM and Version Control-Visual Source Safe (VSS) – Introduction-Advanced Software Engineering Models-Case Study		
	Total Contact Hours :	45

List of Experiments			
1	Develop User Stories for the respective projects that has been assigned (both FR and NFR) in Azure Board		
2	Develop the Business Architecture, Conceptual and Logical Model for the entities defined in the project		
3	Develop the Class Diagram for these defined entities with all attributes and the associated methods		
4	Develop the Sequence diagram for atleast 2 use stories for the respective project		
5	Develop the Architecture diagram (using MVC) for the respective project (picking a template for Azure Architecture Center)		
6	Identify which SOLID design principles would be applicable and write the design document for the same		
7	Develop a view of the github repository in terms of code, design, test plans, test cases etc and showcase the same in Azure Repos		
8	Develop Test Plans, test cases for the user stories		
9	Develop a CI/CD pipeline using Azure DevOps to test the Architecture and Design		
10	Showcase the CI/CD pipeline using Azure DevOps for a single user story		
		Contact Hours	30
		Total Contact Hours	75

Course Outcomes:	
On completion of course, students will be able to	
●	**D**emonstrate proficiency in leveraging Azure services and tools for software construction, including virtual machines, containers, serverless computing, and databases, enabling them to design and deploy scalable and resilient applications on the Azure platform.
●	**I**mplement end-to-end CI/CD pipelines using Azure DevOps, GitHub Actions, or Azure Pipelines, automating the build, test, and deployment processes for software applications, resulting in increased efficiency and reliability of software delivery.
●	Optimizing software applications for performance and scalability on Azure, employing techniques such as auto-scaling, caching strategies, and performance tuning to ensure optimal performance under varying workloads.
●	Develop skills in monitoring and diagnostics using Azure Monitor and Application Insights, enabling them to proactively monitor the health, performance, and availability of software applications, and diagnose and troubleshoot issues efficiently.
●	Deeply understand security best practices for software construction in Azure, including identity and access management, data encryption, network security, and compliance standards, enabling them to build secure and compliant software solutions.Gain practical experience in designing, developing, and deploying software applications on Azure, preparing them for real-world scenarios and equipping them with the skills needed to succeed in software development roles in industry.

Suggested Activities:	
●	Assignment problems, Quiz.
●	Class presentation/Discussion

Textbooks:	
●	Design Patterns, Elements of Reusable Object Oriented Software (Gang of Four) (Erich Gamma, Richard Helm, Ralph Johnson etc.)
●	Patterns of Enterprise Application Architecture (Martin Fowler)
●	Beginning Software Engineering by Rod Stephens
●	Fowler, Martin Beck, Kent, Roberts, Refactoring Improving the Design of Existing Code
●	Clean Architecture by Robert C. Martin
●	Head First Design Patterns by Eric Freeman, Elisabeth Robson
●	Building Microservices Designing Fine-Grained Systems by Sam Newman
●	Vladimir Khorikov. Unit Testing Principles, Practices, and Patterns

Reference Books (s)/Web links:	
1.	Code Complete A Practical Handbook of Software Construction by Steve McConnell
2.	The Pragmatic Programmer Your Journey to Mastery by David Thomas, Andrew Hunt

Subject Code	Subject Name (Lab Oriented Theory Course)	Category	L	T	P	C
CS23532	COMPUTER NETWORKS	PC	3	0	2	4

Objectives:

- Understand the concepts of computer networks and error detection-correction of data.
- Be exposed to various addressing schemes and routing protocols.
- Learn the Transport Layer, flow control and congestion control algorithms
- Be familiar with real time applications of networking devices and tools.
- To configure different devices and trace the flow of information between nodes in the network using various tools

UNIT-I	FUNDAMENTALS AND DATA LINK LAYER	9

Building a network – Requirements – Layering and protocols – Internet Architecture – Network software – Application Programming Interface (sockets) - Performance - Link layer Services - Framing – Error Detection and Correction - Reliable transmission

UNIT-II	MEDIA ACCESS AND INTERNETWORKING	9

Media Access Protocols – ALOHA - CSMA/CA/CD –Ethernet – Wireless LANs - 802.11- Bluetooth - Switching and Forwarding - Bridges and LAN Switches – Basic Internetworking- IP Service Model – IP fragmentation - Global Addresses – ARP - DHCP – ICMP- Virtual Networks and Tunnels.

UNIT-III	ROUTING	9

Routing – Network as Graph - Distance Vector – Link State – Global Internet –Subnetting - Classless Routing (CIDR) - BGP- IPv6 – Multicast routing - DVMRP- PIM.

UNIT-IV	TRANSPORT LAYER	9

Overview of Transport layer – UDP – TCP - Segment Format – Connection Management – Adaptive Retransmission - TCP Congestion control - Congestion avoidance (DECbit, RED) – QoS – Application requirements.

UNIT-V	APPLICATION LAYER	9

E-Mail (SMTP, MIME, POP3, IMAP), HTTP – DNS - FTP - Telnet – web services - SNMP - MIB – RMON.

	Contact Hours	:	45

List of Experiments	
1	Configuration of Network in Linux Environment
2	Learning and Assignment of IP Address to computers
3	Implementation of Subnet mask in IP addressing
4	Write a socket PING program to test the server connectivity
5	Design, Build & Configure Networks using Cisco Packet Tracer tools
6	Study & Implement the different types of Network Cables (RS 232C)
7	Implementation of setup of a Local Area Network (using Switches) – Minimum 3 nodes and Internet

8	Write a socket program Remote Procedure Call using connection oriented / connectionless protocols (programs like echo, chat, file transfer etc)
9	To Identify the various port & its usage using NMAP tool.
10	To capture, save, and analyze network traffic on TCP / UDP / IP / HTTP / ARP /DHCP /ICMP /DNS using Wireshark Tool.
11	Write a code using Raw sockets to implement packet Sniffing
12	Perform a case study using OPNET / NS3 tools about the different routing algorithms to select the Network path with its optimum and economical during data transfer
13	Simulation of Link State routingalgorithm using OPNET or NS3 tool
14	Simulation of Distance Vector Routingalgorithm OPNET or NS3 tool
15	To Analyze the different types of servers using Webalizer tool

	Contact Hours	**:**	**60**
	Total Contact Hours	**:**	**105**

Course Outcomes:

On completion of the course, the students will be able to

•	Choose the required functionality at each layer for given application
•	Trace the flow of information from one node to another node in the network
•	Apply the knowledge of addressing scheme and various routing protocols in data communication to select optimal path.
•	Monitor the traffic within the network and analyse the transfer of packets.
•	Develop real time applications of networks using different tools

Text Books(s):

1	Larry L. Peterson, Bruce S. Davie, “Computer Networks: A Systems Approach”, Fifth Edition, Morgan Kaufmann Publishers Inc., 2011.
2	Behrouz A. Forouzan, “Data Communications and Networking”, Fifth Edition, McGrawHill, 2017.

Reference Book(s) / Web links:

1	William Stallings, “SNMP, SNMPv2, SNMPv3 and RMON 1 and 2”, Third Edition, Pearson Edition, 2009.
2	James F. Kurose, Keith W. Ross,” Computer Networking - A Top-Down Approach Featuring the Internet”, Seventh Edition, Pearson Education, 2017.
3	Andrew S. Tanenbaum, David J. Wetherall, “Computer Networks”, 5th Edition, Prentice Hall publisher, 2010.
4	William Stallings, “Data and Computer Communications”, Eighth Edition, Pearson Education, 2011.
5	Website reference: https://realpython.com/python-sockets/

CO - PO – PSO matrices of course

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12	PSO 1	PSO 2	PSO 3
CS19541.01	3	2	1	0	3	1	1	1	1	0	1	1	2	1	1
CS19541.02	2	2	1	0	2	1	1	0	0	0	2	2	1	1	1
CS19541.03	3	3	1	0	3	0	1	0	0	0	2	1	2	3	2
CS19541.04	2	3	0	0	3	1	1	1	0	0	2	2	1	2	3
CS19541.05	3	2	2	2	3	0	1	1	0	0	3	3	3	3	3
Average Mapping	**2.6**	**2.4**	**1.3**	**2.0**	**2.8**	**1.0**	**1.0**	**1.0**	**1.0**	**0.0**	**2.0**	**1.8**	**1.8**	**2.0**	**2.0**

Note: Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Subject Code	Subject Name (Lab Oriented Theory course)	Category	L	T	P	C
CS23333	Object Oriented Programming Using Java	PC	1	0	6	4

Objectives:	
●	To understand Object Oriented Programming concepts and characteristics of Java.
●	To know the principles of classes, abstraction and inheritance.
●	To create packages, define exceptions and use interface.
●	To use I/O streams and collections in applications.
●	To design and build simple programs using Streams, Lambda and JDBC

UNIT I	INTRODUCTION TO OOP AND JAVA FUNDAMENTALS	3
Introduction to Object Oriented Programming – An overview of Java - Java Architecture - Data Types - Variables- Operators.		
UNIT II	**CLASSES AND INHERITANCE**	3
Classes – Class Fundamentals - A Simple Class - Declaring Objects - Methods – Constructors Inheritance - Inheritance Basics - Member Access - Method Overriding - Abstract Classes - Object Class		
UNIT-III	**PACKAGES, INTERFACE & EXCEPTION HANDLING**	3
Packages - Defining a Package - Access Protection - Imports - Interfaces - Implements - Nested Interfaces - Exception Handling - Types - try - catch - throw - throws – finally.		
UNIT IV	**I/O AND COLLECTIONS**	3
Input / Output Basics – Streams – Byte streams and Character streams – Collection Interfaces – Collection Classes.		
UNIT-V	**STREAMS API, LAMBDA AND JDBC**	3
Stream API – Reduction – Parallel – mapping – Collecting – Iterator - Lambda Expressions Functional Interfaces - Predefined Functional Interfaces - Accessing Databases with JDBC		
	Total Contact Hours :	15

List of Experiments	
1	Programs using control structures.
2	Programs using arrays.
3	Programs using strings and string buffer.
4	Programs using classes and objects.
5	Programs using inheritance.
6	Programs using default & static methods in interfaces.
7	Programs using functional interface.
8	Programs to create user defined exceptions.
9	Programs to implement Object Serialization.
10	Programs using collections-LIST.
11	Programs using collections-SET.
12	Programs using collections-MAP.
13	Programs using STREAMS.
14	Programs using LAMBDA.
15	Simple applications using JDBC.
Contact Hours :	60
Total Contact Hours :	75

Course Outcomes:	
On completion of the course, the students will be able to	
●	Develop Java programs using OOP principles and Strings.
●	Develop Java programs with the concepts inheritance.
●	Build Java applications using exceptions and interfaces.
●	Develop Java applications using I/O and collections.
●	Develop interactive Java applications using Streams and JDBC.
Suggested Activities:	
●	**Quizzes –** basic concepts of JAVA & language basics **(Unit 1).**
●	**Tutorial** – Class & Inheritance **(Unit 2).**
●	**Flipped Classroom –** Packages & Interface **(Unit 3).**
●	**Mind Map, Poster Design –** IO & Collections **(Unit4).**
●	**Implementation of small Systems-** JDBC **(Unit5).**

Textbooks:	
●	Herbert Schildt, “Java The Complete Reference”, 9th Edition, McGraw Hill Education, 2014
●	Cay S. Horstmann, Gary Cornell, “Core Java Volume –I Fundamentals”, 9th Edition, Prentice Hall, 2013.

Reference Books (s)/Web links:	
1.	Paul Deitel, Harvey Deitel, “Java SE 8 for programmers”, 3rd Edition, Pearson, 2015.
2.	Steven Holzner, “Java 2 Black book”, Dreamtech press, 2011.
3.	Timothy Budd, “Understanding Object-oriented programming with Java”, Updated Edition, Pearson Education, 2000.
4.	SCJP Sun Certified Programmer for Java 6 Study Guide. 6th edition, McGrawHill.
5.	https://www.javatpoint.com/java-tutorial
6.	https://java-iitd.vlabs.ac.in/
7.	https://www.hackerrank.com/domains/java

Subject Code	Subject Name (Employability Enhancement Course)	Category	L	T	P	C
GE23421	SOFT SKILLS-I	EEC	0	0	2	1

Description	
●	The course, **"VAP"** intends to enhance the students' confidence to communicate in front of an audience effectively.
●	The emphasis is on improving the spoken skills of the students so that they can communicate both, in the college and in the corporate setting to deliver their message successfully
●	In today's technology driven world, communicating with confidence is imperative.
●	Hence, this course aims at providing students with the necessary practice in the form of debates, discussions and role plays.

Program Learning Goals :	
●	This program will help our students to build confidence and improve their English communication in order to face the corporate world as well as providing them with opportunities to grow within an organization.
Objectives:	
●	To help students break out of shyness.
●	To build confidence.
●	To enhance English communication skills.
●	To encourage students' creative thinking to help them frame their own opinions.

Week	Activity Name	Description	Objective
1	Introduction	The trainer and the college facilitator talk to the students about the course and in turn the students introduce themselves.	To set expectations about the course and the students are made aware of the rules and regulations involved in this program
2	If I ruled the world	This is a quick and useful game by getting students to form a circle and provide their point of view. Each student then repeats what the other has said and comes up with their own opinion.	The aim of this activity is to for students to get to know each other and also develop their listening skills as well as learning how to agree and disagree politely.
3	Picture Narrating	This activity is based on several sequential pictures. Students are asked to tell the story taking place in the sequentia l pictures by paying attention to the criteria provided by the teacher as a rubric. Rubrics can include the vocabula ry or structures they need to use while narrating.	The aim of this activity is to make the students develop creative way of thinking.

4	Brainstorming	On a given topic, students can produce ideas in a limited time. Depending on the context, either individual or group brainstorming is effective and learners generate ideas quickly and freely. The good characteristics of brainstorming are that the students are not criticized for their ideas so students will be open to sharing new ideas.	The activity aims at making the students speak freely without the fear of being criticized. It also encourages students to come up with their own opinions.
5	Debate	Is competition necessary in regards to the learning process?	The aim of this activity is to develop the students ability to debate and think out of the box
6	Short Talks	Here the students are given topics for which they take one minute to prepare and two minutes to speak. They can write down points but can't read them out they can only use it as a reference.	The activity aims at breaking the students' shyness and encouraging them to standup in front of the class and speak. It also aims at creating awareness that they are restricted for time so they only speak points that are relevant and important.
7	Debate	Will posting students' grades on bulletin boards publicly motivate them to perform better or is it humiliating?	This activity aims at enhancing the students unbiased thought process when it comes to exams and grades as well as develop their skills to debate
8	The Art of diplomacy	The facilitator proceeds to share multiple concepts of conversation and helps the participants to identify the various methods of being diplomatic and how do deal with misinformation.	The aim of the lesson is to provide an opportunity for the participants to learn about body language and choosing the appropriate words for conversation.
9	Debate	Are humans too dependent on computers?	The aim of this activity is to test the students debating skills and thought process with a topic that affects everybody in daily life.
10	Story Completion	The teacher starts to tell a story but after 2 sentences he/she asks students to work in groups to create the rest of the story which includes the plot and the ending.	This activity aims at building their narrating skills as well as their creativity and ability to work in a team.
11	Role play debate	Students scrutinize different points of view or perspectives related to an issue. For example, a debate about the question "Should students be required to wear uniforms at school?" might yield a range of opinions. Those might include views expressed by a student (or perhaps two students – one representing each side of the issue), a parent, a school principal, a police officer, a teacher, the owner of a clothing store, and others.	The aim of this activity is to get students to speak based on other people's perspective instead of their own. The students take the role of various characters and debate accordingly.

12	I Couldn't Disagree More	This is a game where students practice rebuttal techniques where one student provides a thought or an idea and the other students starts with the phrase I couldn't disagree more and continues with his opinion	The aim of this activity is to improve general communication skills and confidence.	
13	Feedback	At the end of the session in the final week (12) the trainer would provide feedback to the students on best practices for future benefits	The aim is to do both give feedback to students as well as obtain feedback on the course from them.	
			Total Contact Hours :	**30**

Course Outcomes:	
On completion of the course, the students will be able to:	
●	Be more confident.
●	Speak in front of a large audience.
●	Be better creative thinkers.
●	Be spontaneous.
●	Know the importance of communicating in English.
Reference Books(s):	
●	**Kings Learning work sheets.**

CO - PO – PSO matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CS19443.1	2	2	2	-	-	-	-	-	1	-	-	1	2	2	-
CS19443.2	2	2	3	3	3	-	-	-	2	1	2	1	2	1	-
CS19443.3	2	2	2	2	2	-	-	-	2	1	2	1	1	2	1
CS19443.4	2	2	2	2	2	-	-	-	1	1	-	-	1	2	1
CS19443.5	2	2	2	4	2	-	-	-	2	-	2	2	1	2	3
Average	2.0	2.0	2.2	2.8	2.3	-	-	-	1.6	1.0	2.0	1.3	1.4	1.8	1.7

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3. Substantial (High) No correlation: "-"

Subject Code	Subject Name Lab oriented theory course	Category	L	T	P	C
CD23531	3D MODELLING AND TEXTURING	PC	2	0	2	3

Objectives:
• To create realistic 3D models with accurate geometry and proportions.
• To apply textures, colours, and materials to enhance visual appeal.
• To optimize models for performance on platforms like VR, AR, and games.
• To maintain consistent styling and texturing across all models.
• To use appropriate UV mapping for real-time rendering applications.

UNIT-I	INTRODUCTION TO MAYA	6
Introduction to MAYA Interface -Software and Hardware Requirement-Understanding about View Ports-Tool bar & Menu bar-Layers, Shortcut Keys, Understanding Primitive objects Channel Box & Hot Box-Channel Attributes & Outline Editor		
UNIT-II	**MODELING**	6
Introduction to modelling with Primitive objects NURBS & polygon Tools-Organic and Industrial Designs-Editing Nurbs & Polygons-Learning Menus in Surfaces and Polygons Tabs & Shortcut. -Modelling With Nurbs-Creating NURBS curves & Understanding-Creating primitive objects.		
UNIT-III	**MODELING WITH POLYGONS**	6
Polygon basics, about polygons, -Create and reshape polygons, Knowing, Mesh Menu. Edit Polygons Menu-Combining, separating, and splitting-Booleans, Create Polygon, insert Edge Loop,-Make Hole, Fill Hole, Extrude, Bridge,-Slide edge Tool, Sculpt Geometry Tool etc. ,Reflections, rotations.A23		
UNIT-IV	**TEXTURING**	6
Introduction to materials & understanding materials & behaviour-understanding UV-texture editor & applying single colour to object -hyper shade understanding different types of maps understanding UV mapping & UV manipulation-editing texture in Photoshop.		
UNIT-V	**LIGHTING**	6
Lighting & rendering -Understanding colour theory & introduction to lighting -importance of light in animation-basic lighting concepts types of lights-change the colour of the light light attributes render Introduction to rendering & knowing renderers-software rendering & hardware rendering vector rendering.		
	Total Contact Hours : 30	

List of Experiments	Total Contact Hours : 30
1	Creating Simple Real-World Objects like a chair or table using 3D Modeling Software.
2	Creating both realistic and stylized textures by using texturing and material application
3	Paint textures directly onto a 3D model using software like substance painter or blender.
4	Create multiple assets with a unified theme, applying consistent color palettes, material settings, and texture styles by using consistency in styling
5	Create UV unwrapping techniques to map textures effectively onto 3D models by using UV mapping and real-time rendering
	Mini project: To create a low-poly or cartoon-style character, complete with UV mapping, textures, and basic rigging for animation.

Course Outcomes: On completion of the course, the students will be able to	
CO1	Mastery of 3D Modeling Tools: Gain proficiency in using industry-standard software like Blender, Maya, or 3Ds Max to create detailed 3D models.
CO2	Applying of Texturing Techniques: Learn to design and apply textures, materials, and UV mapping for lifelike or stylized 3D assets.
CO3	Optimizing the Performance : Develop the ability to optimize models and textures for use in gaming, AR/VR, and real-time rendering applications.
CO4	Understanding of Aesthetic Consistency: Achieve a cohesive visual style across projects by using consistent design and texturing practices.
CO5	Knowledge of Rendering and Lighting: Understand how to integrate textures with lighting and rendering techniques for enhanced visual impact.

Text Book(s):
1. George Maestri, “Digital Character Animation”, New Rider , 5th edition,2022.
2. Richard Williams, **“The Animator's Survival Kit”,** Focal Press, 3rd edition, 2020.
3. Teresa Flaxman, **Maya Character Modelling and Animation,** Focal Press, 1st edition, 2020.

Reference Books:	
1	Dariush Derakhshani, “Introducing Autodesk Maya”, 2024, Sybex ,1st edition,2023.
2	Autodesk Official, “Learning Autodesk Maya”, Autodesk Press, 4th edition, 2024.

CO - PO – PSO matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CD23531.1	2	2	3	2	3	3	2	3	3	2	3	3	3	2	3
CD23531.2	2	3	3	2	3	3	2	3	3	2	3	3	3	2	3
CD23531.3	2	3	3	2	3	3	2	3	3	2	3	3	3	2	3
CD23531.4	2	3	3	2	3	3	2	3	3	2	3	3	3	2	3
CD23531.5	2	3	3	2	3	3	2	3	3	2	3	3	3	2	3
Average Mapping	2	**3**	**3**	2	**3**	**3**	2	**3**	**3**	2	**3**	**3**	**3**	2	**3**

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation: "-"

Subject Code	Subject Name (Lab Oriented Theory course)	Category	L	T	P	C
CS23431	OPERATING SYSTEMS	PC	3	0	4	5
For B.E Programme CSE ,CSECS,CSD and B.Tech Programme in IT,AIML & AIDS						

Objectives:
• To study the basic concepts and functions of operating systems.
• To learn about Processes, Threads, Scheduling algorithms
• To understand the process of synchronization and deadlock issues
• To learn and understand the Memory management systems.
• To learn I/O Management and File Systems.

UNIT I	OPERATING SYSTEMS OVERVIEW	9
Introduction – Computer System Organization – Computer System Architecture – Operations – Resource Management – Security and Protection – Virtualization – Computing Environments. Operating Systems Structures: Services – User and OS Interface – System Calls – Linkers and Loaders – Operating system Structure – Building and Booting OS.		
UNIT II	**PROCESS MANAGEMENT**	9
Process Concepts– Process Scheduling - Operations – Inter process Communication- Shared Memory and Message Passing Systems Threads: Overview- multithreading models-issues. CPU Scheduling: – FCFS – SJF – Priority – RR – Multilevel Queue Scheduling - Multilevel Feedback Queue.		
UNIT-III	**PROCESS SYNCHRONIZATION AND DEADLOCKS**	9
Process Synchronization – Critical Section Problem – Peterson's Solution – Hardware Synchronization – Semaphores- Monitors - Classic Problems of Synchronization, Deadlocks: Characterization-Prevention – Avoidance – Detection – Recovery.		
UNIT IV	**MEMORY MANAGEMENT**	11
Main Memory: Background - Contiguous Memory Allocation – Paging - Structure of a page table – Segmentation - Virtual Memory – Demand Paging - Page Replacement-FIFO-LRU-Optimal - Allocation of Frames – Thrashing - Mass Storage Management-Disk scheduling.		
UNIT-V	**FILE MANAGEMENT**	9
File System -Concepts - Access Methods- Directory Structure - Protection - Discretionary Access control and Mandatory Access Control - File System structure– Directory Implementation – Allocation Methods – Free-Space Management- Virtual File System. Case studies: Linux		
	Total Contact Hours :	45

List of Experiments			
1	Basic Unix/Linux commands		
2	Study of Unix editors : sed,vi,emacs		
3	Text processing using Awk script		
4	System calls –fork(), exec(), getpid(),opendir(), readdir()		
5	Scheduling algorithms – FCFS, SJF, Priority and RR		
6	Inter-process Communication using Shared Memory		
7	Producer Consumer Problem Solution using Semaphore		
8	Bankers Deadlock Avoidance algorithm		
9	Contiguous Memory Allocation - First Fit and Best Fit		
10	Page Replacement Algorithms - FIFO & LRU		
11	File Organization Technique- single and Two level directory		
12	Installation and Configuration of Linux in a Virtual Machine		
13	Schedule Cron Tasks – scripts to run on boot, backup and shutdown at a particular time		
14	Building a Simple Loadable Kernel Module for basic operations		
15	Building Linux RPM package from source		
		Contact Hours	60
		Total Contact Hours	105

Course Outcomes: On completion of course, students will be able to
● Interpret the evaluation OS functionality, structure and layers.
● Analyze the various Scheduling algorithms and design a model scheduling algorithm.
● Apply and analyze Intercrosses communications, synchronization and Deadlock
● Compare and contrast various memory management schemes.
● Mount file systems and evaluate various disk scheduling techniques.

Suggested Activities:

- Compare the DOS and Linux Commands
- Design and Analysis of various CPU scheduling algorithm
- Implement an algorithm for synchronization
- Analysis various page replacement algorithms
- Study the various management algorithms used in Windows, Linux am Android OS

Textbooks:	
1.	Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 10th Edition, John Wiley and Sons Inc., 2018.

Reference Books (s)/Web links:	
1.	William Stallings, "Operating Systems – Internals and Design Principles", 9thEdition, Pearson, 2018.
2.	Andrew S. Tanenbaum and Herbert Bos, "Modern Operating Systems", 4th Edition, Pearson, 2016.
3.	Achyut Godbole and Atul Kahate, "Operating System", 3rd Edition, Tata McGraw Hill, 2017.
4.	Pavel Y., Alex I., Mark E., David A., "Windows Internal Part I - System Architecture, Processes, Memory Management and More", 7th Edition, Microsoft Press, 2017.

CO - PO – PSO matrices of course

COs/POs&PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO 8	PO 9	PO 10	PO 11	PO1 2	PS O1	PS O2	PSO3
CS23431.1	2	-	-	-	3	-	1	-	1	2	2	2	3	-	1
CS23431.2	2	2	2	1	2	-	-	-	2	-	2	2	2	3	2
CS23431.3	2	2	2	1	2	-	-	-	1	-	2	2	2	3	2
CS23431.4	2	2	-	-	2	-	-	-	2	-	2	2	3	2	1
CS23431.5	2	-	1	-	2	-	-	1	1	-	2	2	3	-	2
Average	2.0	2.0	1.7	1.0	2.2	-	1.0	1.0	1.4	2.0	2.0	2.0	2.6	2.7	1.6

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation: "- "

Subject Code	Subject Name (Lab Oriented Theory course)	Category	L	T	P	C
CS23531	**Web Programming**	PC	1	0	6	4

Objectives:
• To convey the Internet and Its Application in Real world.
• To introduce the fundamentals of web programming through HTML and CSS.
• To establish the application of Javascript in designing interactive web pages.
• To investigate various elements of ReactJS and design user interfaces to deploy in the real time.

UNIT-I	**WEB BASICS, HTML AND CSS**	4
Introduction World wide web and its evolution - E-mail, Telnet, FTP, E–commerce, Cloud Computing, Video conferencing - Internet service providers, IP Address, URL, Domain Name Servers - Web Browsers, Search Engine -Web Server vs Application Server, HTML Tags, Structure - Block Elements, Text Elements- Lists, Images, section, article, and aside Elements CSS Overview - CSS Rules, CSS Syntax and Style - Class Selectors, ID Selectors, span and div Elements - Cascading, style Attribute, style Container, External CSS Files - CSS Properties: Color Properties, Font Properties, line-height Property, Text Properties, Border Properties. Element Box, padding Property, margin Property - Hosting a Website and GIT		
UNIT-II	**Client Side Programming - Java Script**	2
Hello World Web Page - Buttons, Functions, Variables, Identifiers - Assignment Statements and Objects - Document Object Model, Forms: form Element, Controls, Text Control Accessing a Form's Control Values, reset and focus Methods – Event Handler Attributes: onchange, onmouseover, onmouseout. While Loop, External JavaScript Files, do Loop, Radio Buttons, Checkboxes, for Loop - fieldset and legend Elements- Manipulating CSS with JavaScript- Using z-index to Stack Elements-Textarea Controls - Pull-Down Menus- List Boxes- Canvas and Drawing - Event Handler and Listener.		
UNIT-III	**Server Side Programming - PHP**	5
Introduction- Working principle of PHP -Variables - Constants - Operators - Flow Control and Looping - Arrays - Strings - Functions - File Handling -PHP and HTML - Simple PHP scripts - Databases with PHP.Bootstrap Background and Features - Getting Started with Bootstrap - Grids - Components - Menus and Navigations - Plugins - Flexbox& Layouts.		
UNIT-IV	**REACTJS**	2
React Environment Setup - ReactJS Basics - React JSX - React Components: React Component API - React Component Life Cycle - React Constructors - React Dev Tools - React Native vs ReactJS.		
UNIT-V	**REACT DATAFLOW**	2
React Dataflow: React State - React Props - React Props Validation - Styling React - Hooks and Routing - Deploying React - Case Studies for building dynamic web applications.		
	Total Contact Hours: 15	

List of Experiments	
1	Explore various terminologies related to Internet (ISP, Email, Telnet, FTP, Web browsers, Search Engines)
2	Experiment the use of basic HTML elements.
3	Demonstrate the applications of Lists, Tables, Images, Section, article and aside elements.
4	Investigate the various components of CSS.
5	Develop web pages using HTML and various elements of CSS.
6	Designing simple dynamic webpages using Javascript.
7	Build web pages using While Loop, External JavaScript Files, do Loop, Radio Buttons, Checkboxes, for Loop - fieldset and legend Elements.
8	Manipulating CSS with JavaScript- Using z-index to Stack Elements-Textarea Controls - Pull-Down Menus- List Boxes- Canvas and Drawing - Event Handler and Listener.
9	React Environment Setup - ReactJS Basics - React JSX - React Components: React Component API.
10	Understand React Component Life Cycle and apply React Constructors - React Dev Tools - React Native vs ReactJS
11	Envisage React Dataflow: React State - React Props - React Props Validation - Styling React - Hooks and Routing
12	Deploying React - Case Studies for building dynamic web applications.
	Contact Hours : 60
	Total Contact Hours : 75
Course Outcomes: At the end of this course students will be able to	
● Apply various elements of HTML and CSS.	
● Design interactive web pages using JavaScript.	
● Create Dynamic Web Applications using ReactJS.	
● Deploy and host web applications in Local Servers or Cloud platforms.	
● Building React Applications	

Textbooks:	
1.	Harvey M Deitel, Paul J Deitel and Tem R Nieto, Internet and World Wide Web How to Program, Pearson, 6th Edition, 2020.
2.	Rebah, H.B., Boukthir, H. and Chedebois, A., Website Design and Development with HTML5 and CSS3. John Wiley & Sons, 2022.
3.	Laura Lemay, Rafe Colburn and Jennifer Kyrnin, Mastering HTML, CSS and Javascript Web Publishing, BPB Publication, 1st Edition, 2016.
4.	Alex Banks and Eve Porcello, Learning React: Functional Web Development with React and Redux, O'Reilly Publishers, 1st Edition, 2017

CO - PO – PSO matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CS23531.1	3	3	3	3	3	3	2	2	3	-	1	3	3	3	2
CS23531.2	3	3	3	3	3	3	-	-	-	-	1	1	3	3	2
CS23531.3	3	3	3	3	3	-	-	2	2	-	2	2	3	3	3
CS23531.4	3	3	3	3	3	-	-	-	2	2	2	3	3	3	3
CS23531.5	3	3	3	3	3	2	2	2	-	-	3	3	3	3	3
Average	3	3	3	3	3	1.8	2	2	2.3	2	1.8	2.4	3	3	2.6

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3:Substantial (High) No

Subject Code	Subject Name	Category	L	T	P	C
GE23627	Design Thinking and Innovation (Type - Project based learning)	EEC	0	0	4	2

Objectives:	
•	To understand the design thinking concepts and deep understanding of user needs and experiences.
•	To find the problem statement and To develop innovative design solutions that address identified user challenges
•	To master the process of prototyping and iterating on designs.
•	To conduct thorough market analysis and financial planning
•	To effectively communicate design concepts and findings.

UNIT-I	Introduction to Design Thinking

The design thinking concepts - Different design thinking models - Details of Stanford Design thinking process: Empathize, Define, Ideate, Prototype, Test

Activities:

- Case studies of successful domain based Design Thinking and Innovative projects
- Group discussions on design thinking

UNIT-II	Empathize and Define

User research methods (interviews, surveys, observation, contextual inquiry) - Persona development- Journey mapping – Brainstorming Defining the design problem statement

Activities:

- Conducting user interviews and surveys
- Creating user personas and journey maps
- Identifying key user needs and pain points
- Analyze the user needs and Brainstorming to define problem statement

UNIT-III	Ideate and Create

Brainstorming techniques (e.g., mind mapping, SCAMPER) - Ideation tools (e.g., design thinking tools, concept sketching) - Concept generation and evaluation (e.g. Brainstorming)

Activities:

- Group brainstorming sessions to select the best idea
- Creating concept sketches and prototypes
- Evaluating ideas based on user needs and feasibility

UNIT-IV	Prototype and Test

Low, Medium and high level fidelity for prototyping-Usability testing -Iterative design

Activities:

- Building low-fidelity prototypes (e.g., paper prototypes)
- Conducting usability tests with users
- Iterating on designs based on feedback

UNIT-V	Market Analysis and Implementation

Market research and analysis - Business model development- Financial planning-Implementation strategies **Activities:** • Conducting market research • Developing a business model canvas • Creating a financial projection • Developing an implementation plan
Total Contact Hours: 60

Course Outcomes: On completion of the course, the students will be able to	
CO1	Construct design challenge and reframe the design challenge into design opportunity.
CO2	Interview the user, and know the feelings of users to foster deep user understanding and be able to uncover the deep user insights and needs.
CO3	Develop ideas and prototypes by brainstorming.
CO4	Organize the user walkthrough experience to test prototype
CO5	Develop smart strategies and implementation plan that will deliver/achieve the idea/solution deduced from earlier phases.

Assessment:

- Encourage students to work on real-world design challenges based on the user needs
- Group presentations
- Quizzes and exams
- Evaluation of Project report and viva and also encourage the students for filing patent/ copyright / presenting in conference / publishing in journal

Text Book(s):	
1	Handbook of Design Thinking by Christian Müller-Roterberg, Kindle Direct Publishing, 2018.
2	Design Thinking – A Beginner's Perspective, by E Balagurusamy, Bindu Vijakumar, MC Graw Hill, 2024

Reference Books:	
1	Design Thinking for Entrepreneurs and Small Businesses: Putting the Power of Design to Work – by Beverly Rudkin Ingle, Apress; 1st ed. Edition, 2013
2	Design Thinking: Understanding How Designers Think and Work by Nigel Cross, Bloomsbury Visual Arts; 2 edition 2023

Web links	
1	Design thinking Guide https://www.rcsc.gov.bt/wp-content/uploads/2017/07/dt-guide-book-master-copy.pdf
2	NPTEL Course on Design Thinking and Innovation By Ravi Poovaiah ; https://onlinecourses.swayam2.ac.in/aic23_ge17/preview
3	IITB Design course tools and Resources https://www.dsource.in/

CO-PO Mapping

COs/ POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	3	3	3	2	2	3	3	3	3	3
CO2	3	2	3	3	3	2	2	3	3	3	3	3
CO3	3	2	3	3	3	2	2	3	3	3	3	3
CO4	3	2	3	3	3	2	2	3	3	3	3	3
CO5	3	2	3	3	3	2	2	3	3	3	3	3
Average	**3**	**2**	**3**	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**3**	**3**

1-Slight (Low), 2- Moderate (Medium), 3- Substantial (High) , "-" No correlation

Subject Code	Subject Name (Lab oriented Theory course)	Category	L	T	P	C
IT23E31	Graphics and Multimedia (Common to IT, CSE, CSE CS, CSD)	PE	2	0	2	3

Objectives:

- To gain knowledge about graphics hardware devices and software used.
- To understand the two-dimensional graphics and their transformations.
- To understand the three-dimensional graphics and their transformations.
- To appreciate illumination and color models
- To become familiar with hypermedia models

UNIT-I	INTRODUCTION	6

An Introduction Graphics System : Computer Graphics and Its Types, Application of computer graphics - Graphics Systems : Video Display Devices, Raster Scan Systems, Random Scan Systems, Graphics Monitors and Work Stations, Input Devices, Hard Copy Devices, Graphics Software - Scan Conversion Basics, Line, Circle and Ellipse drawing algorithms – Parallel Curve Algorithm – Filled Area Primitives.

UNIT-II	2D PRIMITIVES	6

Two-dimensional Geometric Transformations: Basic Transformations, Matrix Representation and Homogeneous Coordinates, Composite Transformations, Reflection and Shearing. Two-Dimension Viewing : The viewing Pipeline, Window to view port coordinate transformation, Clipping Operations, Point Clipping, Line Clipping, Polygon Clipping, Text Clipping, Exterior Clipping.

UNIT-III	3D CONCEPTS	6

Three-Dimensional Concepts : Three Dimensional Display Methods, 3D Transformations, Parallel Projection and Perspective Projection Parallel and Perspective projections - 3D Concepts – 3D Object Representation, Polygons, Curved Lines, Splines, Quadratic Surfaces, Splines, B-Splines, Bezier Curves, Beta Splines, 3D Transformations, 3D Viewing – Visible surface identification, Elements of Color, Color Perception, Color Matching, Color Models – XYZ, RGB, YIQ, CMY, HSV -

UNIT-IV	MULTIMEDIA SYSTEM DESIGN	6

Multimedia basics − Multimedia applications − Multimedia system architecture – Evolving technologies for multimedia − Defining objects for multimedia systems − Multimedia data interface standards − Multimedia databases. Compression and decompression − Data and file format standards − Multimedia I/O technologies − Digital voice and audio − Video image and animation − Full motion video − Storage and retrieval technologies.

UNIT-V	HYPERMEDIA	6

Hypermedia messaging -Mobile messaging − Hypermedia message component − Creating hypermedia message − Integrated multimedia message standards − Integrated document management − Distributed multimedia systems. CASE STUDY: BLENDER GRAPHICS Blender Fundamentals – Drawing Basic Shapes – Modelling – Shading & Textures

Total Contact Hours:30

Description of the Experiments	Total Contact Hours: 30
1. Implement Bresenham's line algorithm, Midpoint Circle Algorithm, and Midpoint Ellipse Algorithm. Draw different geometric objects on the screen.	
2. Implement the scan conversion of a polygon and use flood-fill algorithms to fill areas in a graphics window.	
3. Write a program that performs translation, scaling, and rotation on basic 2D shapes (e.g., triangle, rectangle) using matrices.	
4. Write a program that clips polygons to a specified window and displays the clipped polygon.	
5. Write a program that allows the user to perform 3D transformations on basic 3D objects (cube, pyramid) and view the results.	
6. Create and render 3D objects (like cubes, spheres) using polygons and apply basic color and shading techniques.	
7. Create a multimedia application that integrates images, sound, and video in a simple user interface.	
8. Create a program that captures video/audio from a webcam or microphone and displays it on a multimedia interface.	

9. Create an application that allows users to send and receive multimedia messages including text, image, and audio.
10. Create a simple 3D model using Blender (e.g., a house or object) and apply basic shading and textures to the model.

Course Outcomes:
• To gain knowledge about graphics hardware devices and software used.
• To understand the two-dimensional graphics and their transformations.
• To understand the three-dimensional graphics and their transformations.
• To appreciate illumination and color models
• To become familiar with multimedia and hypermedia

SUGGESTED ACTIVITIES (if any) (UNIT/ Module Wise) – Could suggest topic

- Problem solving sessions
- Flipped classroom - Comparing SOA with Client-Server and Distributed architectures
- Survey on various storage technologies
- Activity Based Learning
- Implementation of small module

SUGGESTED EVALUATION METHODS

- Tutorial problems
- Assignment problems
- Quizzes
- Class Presentation/Discussion

Text Book(s):
1.Donald Hearn and Pauline Baker M, "Computer Graphics", 2nd Edition, Prentice Hall, 2014.
1. Richard E. Mayer, "Multimedia Learning" , 3rd Edition, Cambridge University Press, 2020

Reference Books(s) / Web links:
1.Judith Jeffcoate, "Multimedia in Practice: Technology and Applications", Pearson Publisher, Edition 2009.
2. John F. Hughies, Andries Van Dam, Morgan Mcuire, David F. Sklar, James D Foley Steven K Feiner, Kurt Akeley, "Computer Graphics: Principles and Practice", 3rd Edition, Addison Wesley Professional , 2013.
2. Steve Marschner , Peter Shirley, Fundamentals of Computer Graphics ,4th Edition , CRC Press, December 2015

CO-PO-PSO Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO2	PSO3
IT23E31.1	3	2	3	-	1	-	-	1	2	2	3	3	3	2	2
IT23E31.2	3	2	3	-	2	-	-	-	1	2	2	2	3	2	2
IT23E31.3	3	2	3	-	1	-	-	1	-	2	2	2	3	2	2

IT23E31.4	3	2	3	-	2	-	-	-	1	2	1	1	3	1	2
IT23E31. 5	3	2	3	-	1	-	-	1	-	2	2	1	3	1	2
Average	3	2	3	-	1.4	-	-	1	1.3	2	2	1.8	3	1.7	2

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium)

3: Substantial (High) No correlation: “-“

Subject Code	Subject Name Lab Oriented Theory Course	Category	L	T	P	C
CD23631	GAME DESIGN AND DEVELOPMENT	PC	2	0	4	4

Objectives:	
●	To understand the basic concepts in game.
●	To understand how to design a game.
●	To Learn how to coding the game.
●	To develop the 2D game using Unity Game Engine.
●	To develop the 3D game using Unity.

UNIT-I	INTRODUCTION	6
Introduction to Games- The Evolution of Games- Overview of Game Platforms-the Elements of Gameplay-Game AI Multithreading- Sprite Programming.		
UNIT-II	**GAME DESIGN**	**6**
Principles of game design, Game Design Theory,8 type of Fun in Game, Visual style, Generate ideas for a game concept: Idea Development Process, Stimulus, Genre Market Research, Target platform, Creating Prototype: Creating physical Games: Board Game, Card Game, Party Games, Game Design Document.		
UNIT-III	**GAME DEVELOPMENT**	**6**
Game development Cycle, Game Production Cycle and Team, Coding, Visualizing and hearing the Game, Interface Design, Idea for Developing 2D and 3D interactive games, Game Engine		
UNIT-IV	**UNITY UI SYSTEM FOR 2D GAMES**	6
Introduction to Unity Game Engine, Intro to 2D Game system in unity, Sprite Editor in Unity, Sprite Animation in Unity, 2D Physics in Unity, 2D Components, UI system in Unity, 2D Game Project		
UNIT-V	**DEVELOPING 3D GAME USING UNITY**	**6**
Exporting Assets from 3D Software, Different Types of camera in Unity , Character Navigation, 3rd Person Camera movement, Creating Enemy characters runtime, Animation control in Unity Graphic User Interface in Unity.		
	Total Contact Hours : 30	

List of Experiments	Total Contact Hours : 60
1	Design a small 3D game environment with terrains, textures, and objects.
2	Create a simple 2D game like Flappy Bird or Brick Breaker.
3	Create a 2D/3D character and animate it using Blender or Maya.
4	Design a 3D game environment with terrain, objects, and lighting.
5	Implement basic physics mechanics (gravity, jumping, and collisions).
6	Create sound effects and background music to a game.
	Mini projects for a team of two students - Create a full length 2D or 3D Game.

Course Outcomes: On completion of the course, the students will be able to	
CO1	Understand and Analysis the game world.
CO2	Understand designing of a game
CO3	Learn Coding the game
CO4	Develop the 2D game using Unity Game Engine
CO5	Develop the 3D game using Unity Game Engine

Textbooks	
1	Ernest Adams, “Fundamentals of Game Design”, New Riders, 3rd Edition, 2023.
2	Tracy Fullerton, “Game Design”, Addison-Wesley, 4th Edition,2023.
3	Steve SwinkYear, “Game Feel: A Game Designer's Guide to Virtual Sensation”, Addison-Wesley, 2nd Edition, 2023.

Reference Book(s) / Web link(s):	
1.	Jeannie Novak, “Game Development Essentials: An Introduction”, Novy Publishing, 4th Edition, 2022.
2.	https://www.gamedeveloper.com/
3.	https://in.ign.com/
4.	https://www.gameindustry.com/

CO – PO – PSO matrices of course

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CD23631.1	2	2	2	1	1	-	-	-	3	2	2	2	2	2	2
CD23631.2	2	3	2	1	1	-	-	-	3	2	3	2	2	2	2
CD23631.3	2	3	2	2	2	-	-	-	-	-	-	2	2	3	2
CD23631.4	2	-	-	2	3	-	-	-	-	-	-	-	2	2	-
CD23631.5	2	2	-	3	3	-	1	2	3	2	1	3	2	3	-
Average	2	2.5	2	1.8	2	-	1	2	3	2	2	2.25	2	2.4	2

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation: "-"

Subject Code	Subject Name (Lab oriented Theory Courses)	Category	L	T	P	C
AI23331	FUNDAMENTALS OF MACHINE LEARNING	PC	3	0	2	4
Common to AIML & AIDS						

Objectives:	
•	To know the fundamentals of machine learning.
•	Be exposed to linear models.
•	Be familiar with basic machine learning algorithms with classification.
•	To understand machine learning algorithms with clustering.
•	To learn and apply reinforcement learning techniques.

UNIT-I	FOUNDATIONS OF LEARNING	8
Components of learning – learning models – geometric models – probabilistic models – logical models – grouping and grading – learning versus design – types of learning – supervised – unsupervised – reinforcement – theory of learning – feasibility of learning – error and noise – training versus testing – theory of generalization – generalization bound – approximation generalization trade off – bias and variance – learning curve.		
UNIT-II	**LINEAR MODELS**	**9**
Linear classification – univariate linear regression - bivariate regression – multivariate linear regression – regularized regression – Logistic regression. Naïve Baye's – Discriminant Functions -Probabilistic Generative Models -Probabilistic Discriminative Models – Bayesian Logistic Regression.		
UNIT-III	**SUPERVISED LEARNING**	**10**
Perceptron: – multilayer neural networks – back propagation - learning neural networks structures – **support vector machines:** – soft margin SVM – going beyond linearity – generalization and over fitting – regularization – validation. **Decision trees**: Training and Visualizing a Decision Tree - Making Predictions - Estimating Class Probabilities - The CART Training Algorithm - Computational Complexity - Gini Impurity or Entropy - **Ensemble methods:** Bagging- Boosting- Boosting AdaBoost - Gradient Boosting – Xg boost.		
UNIT-IV	**UNSUPERVISED LEARNING**	**10**
Clustering: Nearest neighbor models – K-means – clustering around medoids – silhouttes – hierarchical clustering – k-d trees. **Dimensionality Reduction:** – Linear Discriminant Analysis – Principal Component Analysis – Factor Analysis – Independent Component Analysis.		
UNIT-V	**REINFORCEMENT LEARNING**	**8**
Passive reinforcement learning – direct utility estimation – adaptive dynamic programming – temporal-difference learning – active reinforcement learning – exploration – learning an action utility function – Generalization in reinforcement learning – policy search – applications in game playing – applications in robot control.		
	Contact Hours : 45	

List of Experiments				
1	A python program to implement univariate regression, bivariate regression and multivariate regression.			
2	A python program to implement Simple linear regression using Least Square Method			
3	A python program to implement logistic model.			
4	A python program to implement single layer perceptron.			
5	A python program to implement multi layer perceptron with back propagation.			
6	A python program to do face recognition using SVM classifier.			
7	A python program to implement decision tree.			
8	A python program to implement boosting.			
9	A python program to implement KNN and K-means.			
10	A python program to implement dimensionality reduction – PCA.			
11	Mini project – develop a simple application using tensorflow / keras.			
		Contact Hours	**:**	**30**
		Total Contact Hours	**:**	**75**

Course Outcomes: On completion of the course, the students will be able to	
•	Understand fundamentals of machine learning.
•	Apply the linear models for tuning parameters.
•	Understand and explore the machine learning algorithms with classification.
•	Apply machine learning algorithms with clustering and feature extraction.
•	Apply reinforcement learning techniques for various applications.

Text Books:	
1	Aurélien Géron - Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 2nd Edition. September 21019, Reilly Media, Inc., ISBN: 9781492032649.
2	Stephen Marsland, ―Machine Learning – An Algorithmic Perspective‖, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.
3	Shai Shalev-Shwartz and Shai Ben-David," Understanding Machine Learning: From Theory to Algorithms", Cambridge University Press 2014.

Reference Books:	
1	Alex Smola and S.V.N. Vishwanathan," Introduction to Machine Learning", Cambridge University Press 2011.
2	Andreas C. Müller and Sarah Guido," Introduction to Machine Learning with Python: A Guide for Data Scientists", O'Reilly Media, Inc,2016.
3	S. Russel and P. Norvig, "Artificial Intelligence: A Modern Approach", Third Edition, Prentice Hall, 2009.
4	C. M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2007.

Web links for virtual lab:	
1	https://www.coursera.org/lecture/python-machine-learning/introduction-4f2So
2	https://nptel.ac.in/courses/106/106/106106139/

CO - PO – PSO matrices of course

COs/POs& PSOs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO1 1	PO 12	PSO 1	PSO 2	PSO 3
AI23331.1	3	3	2	-	-	-	-	-	1	-	-	-	3	1	-
AI23331.2	3	3	3	2	-	2	-	-	-	-	-	2	2	3	-
AI23331.3	3	3	3	2	3	-	-	2	2	-	-	-	-	3	-
AI23331.4	3	3	3	-	3	1	-	-	-	-	1	2	2	-	-
AI23331.5	3	3	2	3	2	-	-	1	3	-	3	3	3	3	1
Average	3	3	2.6	1.4	1.4	0.6	-	0.6	0.8	-	0.6	1.4	2	2	0.2

Correlation levels 1, 2 or 3 are as defined below:
1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation: "-"

Subject Code	Subject Name Lab oriented theory course	Category	L	T	P	C
CD23632	3D RIGGING AND ANIMATION	PC	2	0	4	4

Objectives:	
•	To understand the fundamentals of 3D rigging for character and object animation.
•	To create and implement skeletal structures for realistic character movement.
•	To develop skills in applying and customizing animations using key frames and motion paths.
•	To experiment with inverse kinematics (IK) and forward kinematics (FK) techniques for smooth animations.
•	To integrate and optimize rigged and animated assets for use in game engines or rendering pipelines.

UNIT-I	BASIC RIGGING	6
Knowing Joints-Understand Local & World Orientation's-Knowing IK RP & SC Solver& IK Spine Solver-Anticipation Actions for Objects-Follow Through and Over Lapping Action Animation.		
UNIT-II	**CHARACTER RIGGING**	6
Knowing Deformers and there functionality (Linear & Non Linear Deformers) -Knowing Constraints (Point, Orient, Scale, Parent, Pole Vector, Aim…)- Introduction to Joints difference between Local Axis and World Axis for Joints		
UNIT-III	**BASIC ANIMATION**	6
Introduction to Animation in MAYA & Time Codes-Principles of animation (squash and stretch, timing…. etc.)-Doing Object animation & Understanding the Behaviour of Shapes of Objects-Making play blasts Working with Animation Curves Graph Editor.		
UNIT-IV	**CREATE ANIMATED VIDEOS FOR YOUTUBE**	6
Easy drag-and-drop for educational content- Design characters, objects, and environments relevant to the subject		
UNIT-V	**CREATE EDUCATIONAL AND CONCEPT-BASED ANIMATED VIDEOS**	6
Visualize different genres (action, adventure, puzzle) and showcase mechanics (movement, combat, etc.)-Show a character jumping, objects colliding, and particles reacting to different forces.		
	Total Contact Hours: 30	

List of Experiments	Total Contact Hours : 60
1	Create a skeleton structure by placing joints in a 3D model (e.g., a character or object).
2	Apply Inverse Kinematics (IK) solvers to limbs and spines for controlled movement.
3	Apply deformers like bend, twist, lattice, or cluster to 3D objects.
4	Modify joint orientations to control the way rotations happen (local vs. world space).
5	Adjust key frames and curves for smooth transitions in animation (e.g., easing in/out).
6	Apply constraints (e.g., parent, point, orient, or scale constraints) to link props to character movement.

7	Animate a character performing an action, such as a punch, and add follow-through (e.g., hair, clothes, or limbs moving after the primary action).
8	Experiment with these constraints on objects to achieve realistic mechanical movements (e.g., rotating doors, swinging ropes).
	Mini project: Animated Character Walk Cycle with Prop Interaction,Character rigging, animation (keyframing, walk cycle) and Prop animation and constraints.

Course Outcomes: On completion of the course, the students will be able to	
CO1	Students will learn to create and manipulate rigs using skeletons, joints, skinning, weight painting, and joint orientation for 3D models.
CO2	Students will apply animation principles like keyframing, timing, squash and stretch, and follow-through to create smooth, realistic animations.
CO3	Students will master inverse and forward kinematics to efficiently animate limb and spine movements for more natural character animations.
CO4	Students will rig and animate facial expressions, including lip-syncing, to convey emotions and enhance character interactions.
CO5	Students will use deformers to modify 3D objects dynamically, improving animation realism without altering geometry.

Text Book(s):
1. Kelly L. Murdock, “Autodesk Maya Basics Guide", SDC, 1st edition, 2023.
2. Richard Williams, “The Animator's Survival Kit”, Focal Press, 2nd edition, 2013.

Reference Book(s) / Web link(s):	
1	Tina O'Hailey,"Rig It Right! Maya Animation Rigging Concepts", Focal Press,2nd edition,2018.

CO - PO – PSO matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CD23632.1	3	2	3	2	3	3	2	3	3	3	2	3	3	2	3
CD23632.2	3	2	3	2	3	3	2	3	3	3	2	3	3	2	3
CD23632.3	3	2	3	2	3	3	2	3	3	3	2	3	3	2	3
CD23632.4	3	2	3	2	3	3	2	3	3	3	2	3	3	2	3
CD23632.5	3	2	3	2	3	3	2	3	3	3	2	3	3	2	3
Average Mapping	**3**	2	**3**	2	**3**	**3**	2	**3**	**3**	**3**	2	**3**	**3**	2	**3**

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation: “-”

Subject Code	Subject Name (Laboratory Course)	Category	L	T	P	C
CD23621	MOBILE APPLICATION DESIGN AND DEVELOPMENT LABORATORY	PC	0	0	4	2

Experiments	Contact Hours: 60

Setting up Android Studio or equivalent development tool. Basic project setup for mobile app development.

Adaptive UI Design

- Develop a mobile application that adapts to different screen sizes and orientations using Constraint Layout. Focus on aesthetic design, typography, and responsive UI.
- Handling different data formats
- Design Focus: Layout adaptability, visual hierarchy.

Custom Calculator Design

- Design a scientific calculator with custom UI components. The app should handle user input and offer visual feedback for button presses.
- Design Focus: Interaction design, visual feedback, aesthetics.

Wire framing and Prototyping with Figma

- Create wireframes and a functional prototype for a mobile app using Figma. Convert the prototype into a basic Android application.
- Design Focus: Prototyping, flow consistency.

Gesture-Based Interaction App

- Implement gesture-based interactions such as swiping, pinch-to-zoom, and double-tap to navigate different screens or trigger actions in the app.
- Design Focus: Gesture interaction, smooth transitions.

Data Visualization App

- Design and develop a mobile app that displays user data (e.g., steps, expenses) using custom-designed charts and graphs.
- Design Focus: Data visualization, clarity.

Chat Application UI

- Design the UI for a chat application with message bubbles, avatars, and a responsive input field.
- Design Focus: Seamless interaction, UI consistency.

Custom Animation for User Feedback

- Create a mobile app that incorporates custom animations for user actions, such as button clicks or transitions between screens.
- Design Focus: Animation, user feedback.

Location-Based App Design

- Develop a location-based app that displays the user's current location on a map with interactive features such as markers and routes.
- Design Focus: Location-based UI, map interactivity.

Notifications and Alerts Design

- Design custom notifications and alerts, integrating both visual and auditory feedback, and aligning the notification design with the app’s theme.
- Design Focus: Notification design, feedback.

Camera and Image Editing App

- Create an app that captures images, applies filters, crops, and edits photos with a visually appealing UI.
- Design Focus: Image editing tools, intuitive interface.

Mini Project: Complete Mobile Application

- Design and develop a complete mobile application, integrating multiple concepts learned during the course.
- Design Focus: End-to-end design, creativity, functional app architecture.

Objectives:	
●	To understand the components and structure of mobile application design and development frameworks
●	To integrate UI/UX principles and interaction design into mobile app development.
●	To explore creative problem-solving through mobile app design.
●	To work with mobile OS, incorporating intents, fragments, and data storage.
●	To develop mobile applications with database connectivity and multimedia services.

Course Outcomes: On completion of the course, the students will be able to	
CO1	Understand the components and structure of mobile application frameworks with a focus on UI/UX design.
CO2	Create mobile applications with adaptive user interfaces and advanced interaction patterns.
CO3	Implement data storage and network-based features in mobile apps.
CO4	Develop visually appealing applications that incorporate multimedia elements and location services.
CO5	Work with mobile app testing and debugging tools to ensure application quality.

Text Book(s):

1. Jakob Iversen and Michael Eierman, “Learning Mobile App Development", Pearson, 1st Edition, 2024.
2. Jesse FeilerYear, “iOS App Development for Dummies", Dummies,1st Edition ,2024.
3. Rap Payne Year, “Beginning App Development with Flutter", Apress, 1st Edition, 2024.

Reference Books(s) / Web links:	
1.	Valentino Lee, Heather Schneider, Robbie Schell , "Mobile Applications: Architecture, Design, and Development" , O'Reilly Media , 3rd Edition, 2022.
2.	https://developer.android.com/get-started/codelabs
3.	https://www.figma.com/resource-library/design-basics/
4.	https://firebase.google.com/docs
5.	https://www.adobe.com/products/xd/learn
6.	https://www.invisionapp.com/defined/mobile-app-design

Subject Code	Subject Name (Lab Oriented Theory Course)	Category	L	T	P	C
CD23731	FILM MAKING AND RADIO PRODUCTION	PC	2	0	2	3

Objectives:	
•	To understand the fundamentals of visual storytelling, including scriptwriting and storyboarding.
•	To learn the technical aspects of camera operations, lighting, and shot composition.
•	To learn technical aspects of audio recording, mixing, and editing.
•	To design and produce a variety of radio content such as interviews, advertisements, and podcasts.
•	To create complete radio programs incorporating jingles, sound effects, and music.

UNIT-I	Introduction to Media Production	6
Radio as a means of Mass Communication - Brief history of Radio from early years to the present stage - Print vs Electronic Media - Studio set-ups and productions - Field reporting		
UNIT-II	**Radio Broadcasting Technologies**	**6**
Public vs Private broadcasting systems in India - Radio Broadcasting Systems--MW, SW, FM - Internet Radio, Space Radio, Community Radio.		
UNIT-III	**A Guide to Radio Scriptwriting and Management**	**6**
Scriptwriting for different formats of Radio - Elements of Radio scripts - Listing, scheduling and traffic management - Importance of Audience Surveys.		
UNIT-IV	**Functions of Radio in Public and Private Broadcasting Systems**	**6**
Functions of Radio in the context of Public and Private Broadcasting systems - Types and formats of Radio programmes - News, Music, Interviews, Talks, Dramas – Discussions.		
UNIT-V	**Art and Craft of Radio News Reporting**	**6**
Art and Craft of Radio News Reporting - Locating radio news stories - Structure a radio news report - Tools and techniques of radio news reporting - Radio news interviews and vox pops		
	Contact Hours : 30	

List of Experiments	Contact Hours:30
1	Create a short video focusing on different shot types (close-up, medium, wide), camera angles, and movement techniques (panning, tilting, tracking).
2	Set up different lighting setups (3-point lighting, high key, low key) and capture a scene to understand their impact on mood and aesthetics.
3	Record audio separately from video and then synchronize it in post-production, focusing on lip-sync and ambient sound.
4	Shoot footage with a green screen, remove the background in post-production, and place the subject into a virtual environment.
5	Write a short script and direct a scene with actors, focusing on dialogue delivery, blocking, and character motivation.
6	Design and mix sound effects, music, and dialogue for a short film clip.
	Mini project: Produce a short documentary (5-7 minutes) on a subject of choice, utilizing interviews, voice-over narration, and B-roll footage and create a 2-3 minute stop-motion animation using physical objects or clay figures.

Course Outcomes: On completion of the course, the students will be able to	
CO1	Students understand the conceptual process of Radio Production.
CO2	Students evaluate the complexities of Radio Production as a means of mass communication.
CO3	Students create the Radio scripts and other practical implications of the radio production.
CO4	Students evaluate the complexities of the Radio Broadcasting in detail.
CO5	Students create Radio News Report and also the Radio feature reporting.

Textbooks	
1	John J. Lee, "The Roadmap for the Balanced Film Producer", Routledge, edition:1st, 2024.
2	Steven D. Katz, "Film Directing Shot by Shot: Visualizing from Concept to Screen", Routledge, edition: 1st, 2024.
3	David F. O'Connell, "Radio Production", Oxford University, Edition:2nd,2022.
4	Andrew Thom's, "The Radio Producer's Handbook", Sage Publications,dition:1st, 2023**.**

Reference Book(s) / Web link(s):	
1	John O. M. McCarthy**, "The Encyclopaedia of Film Making Techniques", Focal Press, 1st Edition,** 2020.
2	https://www.amazon.com/Filmmakers-Handbook-Comprehensive-Digital-ebook/dp/B00E19FWG0
3	https://www.amazon.com/Film-Directing-Shot-Techniques-Aesthetics/dp/0941188268
4	https://www.amazon.com/Directing-Techniques-Aesthetics-Michael-Rabiger/dp/1285428982

CO – PO – PSO matrices of course

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CD23731.1	2	2	2	1	1	-	-	-	3	2	2	2	2	2	2
CD23731.2	2	3	2	1	1	-	-	-	3	2	3	2	2	2	2
CD23731.3	2	3	2	2	2	-	-	-	-	-	-	2	2	3	2
CD23731.4	2	-	-	2	3	-	-	-	-	-	-	-	2	2	-
CD23731.5	2	2	-	3	3	-	1	2	3	2	1	3	2	3	-
Average	2	2.5	2	1.8	2	-	1	2	3	2	2	2.25	2	2.4	2

Correlation levels 1, 2 or 3 are as defined below:

(Low) 2: Moderate (Medium) 3: Substantial (High) No correlation: "-"

Subject Code	Subject Name Laboratory Course	Category	L	T	P	C
CD23721	VISUAL EFFECTS	PC	0	0	6	3

Objectives:	
•	To understand the basic principles of visual effects, including CGI, compositing, and integration with live-action footage.
•	To learn how to combine multiple elements (live-action, CGI, background) seamlessly into a single frame.
•	To explore techniques for creating and animating 3D models and environments for VFX projects.
•	To understand how to track motion in footage to integrate 3D elements effectively with real-world video.
•	To learn to simulate natural phenomena such as fire, smoke, water, and explosions for realistic effects.

	LIST OF EXPERIMENTS
	GREEN SCREEN COMPOSITING
1	**Green Screen Compositing** **Tools:** Adobe After Effects, Nuke, or DaVinci Resolve. **Experiment Variants:** Experiment with different lighting setups on the green screen to minimize spill and maximize keying quality.
2	**Rot scoping Techniques** **Tools:** After Effects, Nuke, Mocha. **Focus Areas:** Vary the complexity by tracking subjects with different motions and adding elements behind or in front of the rotoscoped layer.
	ROTOSCOPING TECHNIQUES
3	**Motion Tracking and Match Moving** **Tools:** After Effects, Blender, Cinema 4D. **Variants:** Try planar tracking for surfaces and 3D tracking to simulate the camera movement for more immersive VFX scenes.
4	Particle Simulation for Environmental Effects **Tools:** Blender, Houdini, Maya. **Experiment Variants:** Adjust particle behaviour to control effects like the density of snow or smoke spread based on environmental conditions.
	MOTION TRACKING AND MATCH MOVING
5	**Dynamic Lighting and Shadow Matching** **Tools:** Maya, Blender, or Nuke. **Experiment Variants:** Test different lighting angles, intensities, and shadow softness to match the original footage's conditions.
6	**Physics-Based Animation** **Tools:** Blender, Houdini, Cinema 4D. **Focus:** Experiment with gravity, elasticity, and friction settings to see how they impact object interactions.
7	**Time Manipulation Effects** **Tools:** After Effects, Premiere Pro.

	Variants: Test speed-ramping (changing speeds mid-shot) and frame blending to make fast actions smoother or simulate slow-motion effects.		
		Total Contact Hours	**:90**

Course Outcomes: On completion of the course, the students will be able to	
CO1	Identify user interface for compositing, Views and Previews, Layers and Properties & Animation, Colours, Masks, Transparency and Keying, Text, Drawing and Painting, Motion Tracking, Effects and Animation, Presents, Rendering and Exporting.
CO2	Differentiate Image Based Motion Graphics & Video Based Motion Graphics
CO3	Create Effects & Title effects.
CO4	Do colour correction & Keying after effects tools.
CO5	Use Match mover, Motion tracking Overview, Motion Tracking, Workflow and Controls, Rotoscoping, Wire Removal.

Textbooks	
1	Visual Effects Society (VES),"The VES Handbook of Visual Effects", Routledge, Edition: 2nd,2024.
2	Steve Wright Year, "Compositing Visual Effects: Essentials for the Aspiring Artist", Focal Press, Edition: 3rd, 2022.
3	Adobe Creative Team, "Adobe After Effects Classroom in a Book", Adobe Press, Edition: 1st,2023.

Reference Book(s) / Web link(s):	
1	William C. Smith, **"The Complete Guide to Digital Effects for the Screen"**, Focal Press, 1st Edition, 2019.
2	**Barnes & Noble** A large bookstore with a variety of titles: www.barnesandnoble.com
3	**Book Depository** Offers free shipping worldwide: www.bookdepository.com

CO – PO – PSO matrices of course

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CD23721.1	2	2	2	1	1	-	-	-	3	2	2	2	2	2	2
CD23721.2	2	3	2	1	1	-	-	-	3	2	3	2	2	2	2
CD23721.3	2	3	2	2	2	-	-	-	-	-	-	2	2	3	2
CD23721.4	2	-	-	2	3	-	-	-	-	-	-	-	2	2	-
CD23721.5	2	2	-	3	3	-	1	2	3	2	1	3	2	3	-
Average	2	2.5	2	1.8	2	-	1	2	3	2	2	2.25	2	2.4	2

Correlation levels 1, 2 or 3 are as defined below:

(Low) 2: Moderate (Medium) 3: Substantial (High) No correlation: "-"

Subject Code	Subject Name	Category	L	T	P	C
CS23A32	**Robotic Process Automation**	**OE**	**1**	**0**	**4**	**3**

O**bjectives:**
● Prepare to become Junior RPA Developers.
● Learn the basic concepts of Robotic Process Automation.
● Develop familiarity and deep understanding of UiPath tools.
● Develop the ability to design and create robots for business processes independently.
● Develop skills required to pass UiPath Automation Developer Associate v1.0.

	List of Experiments
1.	Downloading and Installing UiPath Academic Alliance and connect to Orchestrator.
2.	Installing UiPath Extension in Browsers.
3.	Installing Activity Packages in UiPath Studio - Manage Packages feature to find, install, update and remove packages.
4.	Experiments based on variables and arguments.
5.	Algorithmic Approach: Selection control structures.
6.	Algorithmic Approach: Iteration control structures.
7.	Debugging - Debug modes, debug actions and the debug ribbon option to debug a file or the entire Project and simple and conditional breakpoints and simple and conditional trace points.
8.	Exception Handling - Try Catch, Throw, Rethrow and Retry Scope.
9.	Logging - Apply logging best practices during development.
10.	UI Automation – Modern Recorder, Modern UI Automation Input Activities and Input Methods, Modern UI Automation Output Activities and Output Methods, UI Synchronization with activities available in the Modern Design Experience, static and dynamic Descriptors.
11.	Excel Automation.
12.	Email Automation.
13.	PDF Automation.
14.	Working with Files and Folders.
15.	Data Manipulation.
16.	Version Control Integration.
17.	Libraries and Templates.
18.	Workflow Analyzer
19.	Orchestrator: Invoice Processing – Dispatcher.
20.	Orchestrator: Invoice Processing – Performer.
Contact Hours	**: 45**

C**ourse Outcomes:** On completion of the course, students will be able to:	
● Start working as Junior RPA Developers.	
● Understand the fundamental principles of robotic process automation.	
● Become familiar with and gain a thorough knowledge of UiPath's software tools.	
● Design and build automation robots for business tasks on their own.	
● Successfully pass the UiPath Automation Developer Associate v1.0 certification exam.	
Text Books:	
1.	UiPath Associate Certification Guide: The go-to guide to acing your Associate certification exam with the help of mock tests and quizzes, Niyaz Ahmed, Lahiru Fernando, Rajaneesh Balakrishnan, Packt Publishing Limited, 2022.
2.	Learning Robotic Process Automation: Create Software Robots and Automate Business Processes with the Leading RPA Tool – UiPath, Alok Mani Tripathi, Packt Publishing Limited, 2018.
Reference Books:	
1.	Robotic Process Automation Projects: Build real-world RPA solutions using UiPath and Automation Anywhere, Nandan Mullakara, Arun Kumar Asokan, Packt Publishing Ltd., 2020.
2.	The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems, Tom Taulli, Apress, 2020.
3.	Democratizing Artificial Intelligence with UiPath: Expand automation in your organization to achieve operational efficiency and high performance, Fanny IP, Jeremiah Crowley, Packt Publishing Limited, 2022.
4.	UiPath Administration and Support Guide: Learn industry-standard practices for UiPath program support and administration activities, Arun Kumar Asokan, Packt Publishing, 2022.

CO - PO – PSO matrices of course

PO/PSO CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CS23A32.1	3	2	2	1	3	-	-	-	1	3	3	2	2	2	1
CS23A32.2	1	1	2	3	3	-	-	-	1	2	3	1	3	2	1
CS23A32.3	2	3	2	3	3	-	-	-	2	3	1	1	3	3	3
CS23A32.4	1	2	1	2	2	-	-	-	1	2	1	3	3	3	2
CS23A32.5	3	3	3	3	3	-	-	-	3	1	1	1	3	2	1
Average	2	2.2	2	2.4	2.8	-	-	-	1.6	2.2	1.8	1.6	2.8	2.4	1.6

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3:Substantial (High) No

Course Code	Course Title (Theory Course)	L	T	P	C
MCB2302	Digital Marketing and Web Analytics	3	0	0	3

Objectives:	
	To gain marketing advantage by learning digital marketing fundamentals to achieve better user. engagement strategies.
	To increase brand awareness and visibility.
	To develop customer engagement and loyalty.
	To perform quantitative and qualitative analysis to give business that extra advantage.
	Improve website usability and increase website traffic.

UNIT-I	ONLINE MARKET SPACE	9
Digital Marketing Strategy- Components -Opportunities for building Brand Website - Planning and Creation- Content Marketing.Case study: Build a digital branding strategy for a multinational apparel shop to help the brand establish itself as a new product in the market.		
UNIT-II	**TERMINOLOGY USED IN DIGITAL MARKETING**	**9**
PPC and online marketing through social media, Social Media Marketing, SEO techniques, Keyword advertising, Google web-master and analytics overview, Affiliate Marketing, Email Marketing, Mobile Marketing. Case study: Social media marketing using Facebook Ads Manager.		
UNIT-III	**DIGITAL MARKETING TECHNOLOGY**	**9**
Technology behind digital marketing - Evolution of digital marketing- Digital Marketing Strategy-10Ps of digital marketing-Choosing web designer / developer- Trust in Internet Marketing- Ethical and Legal Issues- Future of digital marketing.Case study: Application of Google Ads Manager in any Healthcare, Finance or Banking tracks.		
UNIT-IV	**WEB ANALYTICS**	**9**
Present and Future, Data Collection - Importance and Options, Overview of Qualitative Analysis, Business Analysis, KPI and Planning, Critical Components of a Successful Web Analytics Strategy, Web Analytics Fundamentals, Concepts, Proposals & Reports, Web Data Analysis. Case study: Application of Google Analytics in E-commerce track.		
UNIT-V	**SEARCH ANALYTICS**	**9**
Search engine optimization (SEO), non-linear media consumption, user engagement, user generated content, web traffic analysis, navigation, usability, eye tracking, online security, online ethics, content management system, data visualization, RSS feeds, Mobile platforms, User centered design, Understanding search behaviors.		
Contact Hours :		**45**

Course Outcomes: On completion of the course, students will be able to	
•	Know how to improve website visits and sales.
•	Develop a mass strategy and guide campaigns to increase sales and revenue.
•	Apply digital marketing strategy to increase customer lifetime value.
•	Perform web analytics process for better optimization.
•	Effectively use the search analytics insights to support brand recognition and ROI

Text Books:	
1.	*Ryan Deiss & Russ Henneberry, "Digital Marketing for Dummies", 202012017.2017John Wiley Sons, Inc. 2020*
2.	Dave Chaffey & Fiona Ellis-Chadwick, "Digital Marketing: Strategy, Implementation & Practice", Sixth edition, Pearson, 2016.
3.	Dr.Anil Maheshwari, "Data Analytics Made Accessible", 2023.
Reference Books / Web links:	
1.	*K. M. Shrivastava, "Social Media in Business and Governance", Sterling Publishers Private Limited, 2013.*
2.	*Christian Fuchs, "Social Media a Critical Introduction", SAGE Publications Ltd, 2014.*
3.	*Bittu Kumar, "Social Networking", V & S Publishers, 2013.*
4.	*Avinash Kaushik, "Web Analytics - An Hour a Day", Wiley Publishing, 2007.*
5.	*T. Peterson, "Web Analytics Demystified", Celilo Group Media and Café Press, 2004.*
6.	*TakeshiMoriguchi, "Web Analytics Consultant Official Textbook", 7th Edition, 2016.*

CO - PO – PSO matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
MCB2341.1	3	2	-	3	3	1	-	-	-	-	2	3	3	2	2
MCB2341.2	3	3	2	3	3	1	-	-	-	1	2	3	3	3	2
MCB2341.3	3	3	3	3	3	-	-	-	-	1	2	3	3	3	3
MCB2341.4	3	3	3	3	3	-	-	-	-	2	3	3	3	3	3
MCB2341.5	3	2	3	3	3	1	-	-	-	3	2	3	3	3	2
Average Mapping	**3**	**2**	**3**	**3**	**3**	**1**	-	-	-	**3**	**2**	**3**	**3**	**3**	**2**

Correlation levels 1, 2 or 3 are as defined below:
1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

No correlation: "-"

Subject Code	Subject Name (Lab Oriented Theory course)	Category	L	T	P	C
CS23A36	3D PRINTING AND DESIGN	PE	2	0	2	3

Objectives:
• To discuss on basis of 3D Printing
• To explain the file format of 3D Printing techniques
• To explain the processes of 3D Printing
• To explain and demonstrate INKJET technology
• To explain and demonstrate laser technology

UNIT I	**INTRODUCTION TO CAD**	**6**
Coordinate systems: Geometric co-ordinate systems - Cartesian, Cylindrical and Spherical coordinate systems. Display co-ordinate systems - Global, Local, View and Screen coordinate systems. Curves: Definition - Parametric and non- parametric forms of analytical and synthetic curves. Analytical Curve modeling - Line Segment, Circle, Ellipse. Synthetic Curve modeling - Hermite Cubic Spline, Bezier, B-spline .Surfaces and types. Mathematical modeling of Solids: Properties of solid model, Solid modeling Techniques - Boundary representation, Constructive Solid Geometry, Analytical Solid Modeling, Sweep representation schemes. Solid Manipulation Techniques.		
UNIT II	**STL FILE FORMAT AND MANIPULATION**	**6**
Introduction, Preparation of CAD Models – The STL File Format, Binary/ASCII ,Creating STL Files from a CAD System, Calculation of Each Slice Profile, Technology Specific Elements, Problems with STL Files, STL File Manipulation- Viewers, STL Manipulation on the AM Machine,Beyond the STL File- Direct Slicing of the CAD Model, Color Models, Multiple Materials, Use of STL for Machining.		
UNIT-III	**3D PRINTING PROCESSES**	**6**
Vat photo polymerization, Material jetting, Binder jetting, Powder bed fusion, Material extrusion, Directed energy deposition, Sheet lamination, 3D printing Processes limitations and Industrial applications.		
UNIT IV	**INKJET TECHNOLOGY**	**6**
Printer- Working Principle, Positioning System, Print head, Print bed, Frames, Motion control; Print head Considerations – Continuous Inkjet, Thermal Inkjet, Piezoelectric Drop-on-Demand; Material Formulation for jetting; Liquid based fabrication – Continuous jet, Multijet; power based fabrication- Colourjet.		
UNIT-V	**LASER TECHNOLOGY**	**6**
Light Sources – Types ,Characteristics ; Optics – Deflection, Modulation; Material feeding and flow- Liquid, powder; Printing machines – Types, Working Principle, Build Platform, Print bed Movement, Support structures.		
	Total Contact Hours :	**30**

List of Experiments		
1	Analyze the CAD software's interface and fundamental tools	
2	Study 3D printers including print head, build envelope , materials used and related support removal systems	
3	Review the Commands for moving from 2D to 3D	
4	Adept CAD commands for exploring 3D objects	
5	Design every Day Object Using Thingiverse, Shapeways, and GitFab ▪ Mobile Stand ▪ Football ▪ Tooth Brush	
6	Use the CAM Software to prepare files for 3D Printing	
7	Manipulate machine movement and material layering	
Contact Hours :		**30**
Total Contact Hours :		**60**

Course Outcomes: On completion of course you will be able to
● Outline and examine the basic concepts of 3D Printing technology suing CAD software
● Outline of File Format and manipulation
● Students can able to understand the basics concepts of printing processes
● Students can able to explain and categories the working principles of Inkjet technology
● Students can able to explain and categories the working principles of laser technology

Textbooks:	
1.	Christopher Barnatt, 3D Printing : The Next Industrial Revolution ,CreateSpace Independent Publishing platform,2013
2.	Ibrahim Zeid , Mastering CAD CAM Tata Mc Graw- Hill Publishing Co.,2007

Reference Books (s)/Web links:	
1.	C. K. Chua, K. F. Leong, C. S. Lim: Rapid Prototyping: Principles and Applications, Second Edition, World Scientific publishers ,2010
2.	Ian M. Hutchings , Graham D. Martin, Inkjet Technology for Digital Fabrication, John Wiley & Sons,2013
3.	Joan Horvath , Mastering 3D Printing , APress , 2014

CO - PO – PSO matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CS23A36.1	1	1	2	2	3	1	-	-	2	-	2	2	3	2	1
CS23A36.2	3	2	3	3	3	2	-	-	3	-	3	2	3	2	3
CS23A36.3	2	2	2	2	2	2	-	-	2	-	2	2	3	2	2
CS23A36.4	2	2	2	2	3	2	-	-	2	-	2	2	3	3	2
CS23A36.5	1	3	3	3	3	3	-	-	3	-	3	3	3	3	1
Average	1.8	2	2.4	2.4	2.8	2	-	-	2.4	-	2.4	2.2	3	2.4	1.8

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3:Substantial (High) No

Subject Code	Subject Name (Theory Course)	Category	L	T	P	C
IT23A31	**INTERNET OF THINGS** (Common to IT, AIML, AIDS, CSE, CSE CS,)	PE	3	0	0	3

Objectives:
● To understand the basics of Internet of Things and communication protocols.
● To understand the basic principles, architecture, and components, Methods of IoT systems.
● To explore the hardware aspects, including microcontrollers (e.g., Arduino, Raspberry Pi) and sensors commonly used in IoT projects.
● To gain hands-on experience with popular IoT platforms, Physical servers and cloud.
● To learn how to process, analyze, and visualize data collected from IoT devices to derive actionable insights

Unit – I	**Introduction to Internet of Things**	9
Introduction – Definition and characteristics of IoT – How IoT Works? – IoT Applications- Challenges of IoT – Advantages and Disadvantages of IoT - IoT Protocols – Logical Design of IoT: IoT Functional blocks – IoT Communication Models – IoT Communication APIs.		
UNIT-II	**Internet of Things Architecture and Design Methodologies**	9
IoT Architecture – IoT Reference Architecture – IOT Design Methodology: Domain Specification-Functional View, Information View, Operation and deployment, Device and Component Integration, Application development and deployment UNIT-III IOT ELEMENT		
UNIT-III	**Internet of Things Hardware and Management**	9
Building blocks of an IoT Device – Raspberry Pi, Arduino – Sensors, Communication Modules: Bluetooth, Zigbee, RFID - Power Sources –Data Management, Business Processes in IoT		
UNIT-IV	**IOT Platforms and Cloud Management**	9
Physical servers and cloud - XaaS, M2M , WAMP- AutoBahn for IoT – Xively Cloud for IoT – Django – Designing a RESTful Web API –Google cloud for IoT.		
UNIT-IV	**Tools and Applications**	9
Retail, Health care, Transportation, Agriculture and environmental, Smart city, Government and military, Smart home		
	Contact Hours: 45	

Course Outcomes: On completion of the course, the students will be able to
● Know about IoT and its functionalities.
● Interpret IoT Architecture.
● Implement the various IoT elements and design the system.
● Understand the IoT physical servers and cloud integration.
● Design and develop the various applications in IoT

SUGGESTED ACTIVITIES

Case Study Analysis: Analyze case studies that implement Internet of Things on the following Sectors- Retail, Health care, Transportation, Agriculture and environmental, Smart city, Government and military, Smart homes.

SUGGESTED EVALUATION METHODS

- Mini Projects
- Assignment problems
- Quizzes

Text Book(s):

1. Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press,First Edition, 2012
2. Dieter Uckelmann, Mark Harrison, Michahelles, Florian, "Architecting the Internet Of Things", 2011 Edition. Springer,April 2011.
3. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key Applications and Protocols", Second Edition, John Wiley & Sons Inc, 2012.

Reference Books(s) / Web links:

1. Vijay Madisetti and ArshdeepBahga, ―Internet of Things (A Hands-on-Approach)‖,1st Edition, Orient Blackswan Private Limited, 201**5**

2. Amit Kumar Tyag, Internet of Things Theory and Practice: Build Smarter Projects to Explore the IoT Architecture and Applications, BPB Publications, 27 July 2022

CO-PO-PSO Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT23A31.1	3	3	-	2	3	2	-	-	2	-	1	2	3	2	3
IT23A31.2	3	3	-	2	3	2	-	-	2	-	1	2	3	2	3
IT23A31.3	3	3	-	2	3	2	-	-	2	-	1	2	3	2	3
IT23A31.4	3	3	-	2	3	2	-	-	2	-	1	2	3	2	3
IT23A31. 5	3	3	-	2	3	2	-	-	2	-	1	2	3	2	3
Average	3	3	-	2	3	2	-	-	2	-	1	2	3	2	3

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation: "-"

Subject Code	Subject Name (Lab Oriented Theory course)	Category	L	T	P	C
CS23A33	Cyber Security and Forensics	PE	2	0	2	3

Objectives:
● To learn about Cyber Crime and Cyber Laws
● To understand Cyber attacks and tools to mitigate it.
● To learn about Computer Forensics and understanding computer Investigation
● To become familiar with evidence collection and forensics tools
● To learn to analyze and validate forensic data

UNIT I	INTRODUCTION	6
Cyber Security- History of Internet - Impact of Internet - Reason for Cyber Crime - Need for Cyber Security - History of Cyber Crime–Cybercriminals – Classification of Cybercrimes– A Global Perspective on Cyber Crimes – Cyber Laws-The Indian IT Act		
UNIT II	**ATTACKS AND COUNTERMEASURES**	**6**
Malicious Attack Threats and Vulnerabilities: Scope of Cyber-Attacks – Security Breach – Types of Malicious Attacks – Malicious Software – Common Attack Vectors – Social engineering Attack – Wireless Network Attack – Web Application Attack – Attack Tools – Countermeasures		
UNIT-III	**INTRODUCTION TO COMPUTER FORENSICS**	**6**
Introduction to Traditional Computer Crime and its problems – Introduction to Identity Theft & Identity Fraud – Types of CF techniques - Incident and incident response methodology - Forensic duplication and investigation – Preparation for IR: Creating response tool kit and IR team – Forensics Technology and Systems - Understanding Computer Investigation – Data Acquisition.		
UNIT IV	**EVIDENCE COLLECTION AND FORENSICS TOOLS**	**6**
Processing Crime and Incident Scenes – Working with Windows and DOS Systems –Current Computer Forensics Tools- Software/ Hardware Tools		
UNIT-V	**ANALYSIS AND VALIDATION**	**6**
Validating Forensics Data – Data Hiding Techniques – Performing Remote Acquisition – Network Forensics – Email Investigations – Cell Phone and Mobile Devices Forensics		
	Total Contact Hours :	**30**

List of Experiments	
1	Linux auditing using Lynis and increase the hardening index using security tools
2	Hardening Linux OS using various configuration to reduce the attack surface
3	Analyze Web Application Security using N-Stalker tool
4	Perform open source intelligence gathering using Netcraft, Whois Lookups, DNS Reconnaissance, Harvester and Maltego
5	Live Data Acquisition of a folder and take its image using FTKImager
6	Recover deleted file using FTKImager
7	Analyze RAM dump using Volatility tool
8	Collect Email Evidence in Victim PC and Extract Browser Artifacts (ChromeHistory view for Google Chrome)
9	Perform Live Forensics Case Investigation using Autopsy
10	Study Email Tracking and Email Tracing and write a report on them.
Contact Hours :	**30**
Total Contact Hours :	**60**

Course Outcomes: On completion of course you will be able to

- Explain the basics of Cybercrime and Cyber Laws
- Identify various types of cyber-attacks and take appropriate countermeasures
- Apply computer forensics investigation and to do data acquisition
- Apply various forensics tools for evidence collection
- Analyze and Validate the evidence collected

Suggested Activities:

- Assignment problems, Quiz.
- Class presentation/Discussion

Textbooks:

1.	Anand Shinde, “Introduction to Cyber Security Guide to the World of Cyber Security”, Notion Press, 2021
2.	Bill Nelson, Amelia Phillips, Frank Enfinger, Christopher Steuart, “Computer Forensics and Investigations”, Cengage Learning, India Edition, 2016.

Reference Books (s)/Web links:

1.	MarjieT.Britz, “Computer Forensics and Cyber Crime”: An Introduction”, 3rd Edition, Prentice Hall, 2013.
2.	Dejey, S. Murugan - Cyber Forensics, Oxford University Press, India, 2018
3.	CEH official Certfied Ethical Hacking Review Guide, Wiley India Edition, 2015.
4.	John R.Vacca, “Computer Forensics”, Cengage Learning, 2005
5.	Xiaodong Lin, "Introductory Computer Forensics: A Hands-on Practical Approach", Springer, 2018

CO - PO – PSO matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CS23A33.1	1	1	1	1	-	1	-	-	-	-	1	-	2	2	2
CS23A33.2	1	3	1	3	2	1	-	-	-	-		-	2	2	1
CS23A33.3	2	1	1	1	-	1	-	-	-	-	1	-	2	2	2
CS23A33.4	3	3	2	2	2	1	-	-	-	-		-	2	2	2
CS23A33.5	3	2	1	1	1	1	-	1	-	-	1	-	2	2	2
Average	2	2	1.2	1.6	1.6	1	-	1	-	-	1	-	2	2	1.8

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3:Substantial (High) No

Course Code	Subject Name (Lab Oriented Theory course)	Category	L	T	P	C
CS23632	Cryptography and Network Security	PC	2	0	2	3

Objectives:

- Learn basics of encryption and Number Theory.
- Understand the methods of public key encryption.
- Acquire knowledge of hash functions and digital signatures.
- Apply techniques of system level securities.
- Know the current trends in e-mail, IP and web security

UNIT I	INTRODUCTION AND NUMBER THEORY	6

OSI security architecture-Network security model-Classical Encryption techniques (Symmetric cipher model, Substitution techniques, Transposition techniques, Steganography)-Number Theory: Modular arithmetic-Euclid's algorithm-Fermat's and Euler's theorem -The Chinese Remainder theorem

UNIT II	BLOCK CIPHERS AND PUBLIC KEY CRYPTOGRAPHY	6

Data Encryption Standard (DES) – Advanced Encryption Standard (AES) – Triple DES – Public key cryptography-Principles of public key cryptosystems-The RSA algorithm-Key management-Attacks on RSA – Diffie Hellman Key exchange – Elliptic curve arithmetic-Elliptic Curve Cryptography (ECC)

UNIT-III	HASH FUNCTIONS AND DIGITAL SIGNATURES	6

Authentication requirement – MAC – Hash function – MD5 - SHA - HMAC - Merkle Hash Tree–-Digital signature and authentication protocols - DSS – Zero Knowledge Proofs (ZKP) and its Use Cases

UNIT IV	SECURITY PRACTICE AND SYSTEM SECURITY	6

Kerberos – Firewall types and design - Intrusion detection system – Malicious software – Antivirus – Case Study - WannaCry Ransomware – Kaspersky Antivirus Scan Engine – Federated Identity Management

UNIT-V	E-MAIL, IP AND WEB SECURITY	6

E-mail Security – Pretty Good Privacy-S/MIME – IPSecurity- Overview of IPSec - IP and IPv6-Authentication Header - Encapsulation Security Payload (ESP) – Web Security - SSL/TLS Basic Protocol-computing the keys- client authentication – Case Study - Unified Payment Interface (UPI)

Contact Hours: 30

List of Experiments

1	Installation and Configuration of Kali Linux/Parrot OS in a VMware/VirtualBox.	
2	Encryption Crypto 101 in TryHackMe Platform	
3	Perform Man-in-the-middle (MITM) attacks using the Ettercap tool.	
4	Demonstrate hash cracking using John the Ripper tool.	
5	Perform various configurations of Iptables Firewall in Linux.	
6	Snort IDS/IPS to detect and prevent real time threats in TryHackMe Platform.	
7	Perform Code Injection on Application Process using Ptrace.	
8	Privilege Escalation in TryHackMe Platform	
9	Demonstrate various exploits of Window OS using Metasploit Framework	
10	Perform Wireless Audit on routers and decrypt the WPA keys using Aircrack-ng	
	Contact Hours:	**30**
	Total Contact Hours :	**60**

Course Outcomes: On completion of course you will be able to	
● Grasp concepts in classical encryption techniques and number theory.	
● Thoroughly understand Public Key Encryption and apply to real-world applications.	
● Apply hashing algorithms and digital signatures.	
● Comprehend system level securities.	
● Perceiving the best in email, IP and Web Security.	
Textbooks:	
1	William Stallings, "Cryptography and Network Security-Principles and Practices", Seventh Edition, Pearson Education, 2017
	Christo Paar and Jan Pelzl, "Understanding Cryptography: A Textbook for Students and Practitioners", First Edition, Springer, 2010
Reference Books (s)/Web links:	
1.	JoxeanKoret and Elias Bachaalany," The Antivirus Hackers Handbook", First Edition, Wiley, 2015
	Douglas R. Stinson," Cryptography: Theory and Practice", Third Edition, by, CRC Press, Taylor and Francis Group (Indian Edition), 2006
	https://blockonomi.com/merkle-tree/
	https://chain.link/education/zero-knowledge-proof-zkp
	https://www.npci.org.in/what-we-do/upi/product-overview
	https://content.kaspersky-labs.com/fm/site-editor/53/5388886ff3e57f1181c2f8191aef4810/source/ksendatasheet2024.pdf

CO - PO – PSO matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CS23632.1	3	3	1	2	0	2	0	0	1	0	0	3	2	2	2
CS23632.2	3	3	2	1	0	0	0	0	1	0	0	3	2	2	2
CS23632.3	3	3	2	2	2	0	0	2	0	0	0	3	1	1	2
CS23632.4	0	1	2	2	2	0	0	0	2	0	0	3	1	1	2
CS23632.5	0	2	2	2	2	0	0	0	2	1	0	3	1	1	2
Average	**3.0**	**2.4**	**1.8**	**1.8**	**2.0**	**2.0**	**-**	**2.0**	**1.5**	**1.0**	**-**	**3.0**	**1.4**	**1.4**	**2.0**

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3:Substantial (High) No

Subject code AI23B36	Cognitive Science	Category	L 3	T 0	P 0	C 3

Objectives: This course will enable students to
● To learn the basics of cognitive science ● To understand the physiology of the Brain and various philosophy of the Mind ● To learn about how we produce and understand language. ● To understand the basic cognitive architecture of how perception and action produce behavior. ● To learn about the cognitive processes of humans and other intelligent systems.

UNIT-I	Introduction to Cognitive Science	9
The prehistory of cognitive science- The discipline matures: Three milestones-The turn to the brain-Cognitive systems as functional systems-The anatomy of the brain and the primary visual pathway-Extending computational modeling to the brain-Mapping the stages of lexical processing		
UNIT-II	Cognitive science and the integration challenge	9
Levels of explanation: The contrast between psychology and neuroscience-The integration challenge-Local integration I: Evolutionary psychology and the psychology of reasoning-Local integration II: Neural activity and the BOLD signal-Marr's tri-level hypothesis and the integration challenge-Models of mental architecture		
UNIT-III	Information-Processing Models Of The Mind	9
The physical symbol system hypothesis-From physical symbol systems to the language of thought -Applying the symbolic paradigm-Neural networks and distributed information processing -Neural network models of cognitive processes: Language learning in neural networks-Neural network models of children's physical reasoning.		
UNIT-IV	The Organization Of The Mind	9
Architectures for intelligent agents-Fodor on the modularity of mind-The massive modularity hypothesis-Hybrid Architectures-Strategies for brain mapping: Structure and function in the brain-Studying cognitive functioning: Techniques from neuroscience		
UNIT-V	New horizons: Dynamical systems and situated cognition	9
Cognitive science and dynamical systems-Applying dynamical systems-Situated cognition and biorobotics-Information processing without conscious awareness-The global workspace theory of consciousness-Exploring the connectivity of the brain-Building artificial brain systems		
Total Contact Hours:45		

Text Book(s):

1.Bermúdez, José Luis. Cognitive science: An introduction to the science of the mind. Cambridge University Press, 2017.

Reference Books(s) / Web links:

1. The Encyclopedia of Cognitive Science
2. Andy Clark: Mindware: An Introduction to the philosophy of cognitive science
3. Andy Clark: Natural born cyborgs: Minds, Technologies, and the Future of Human Intelligence
4. Bradley Voytek & Timothy Verstynen: Do Zombies Dream of Undead Sheep? A Neuroscientific View of the Zombie Brain
5. Fromkin, Rodman, and Hyams. An Introduction to Language, Boston, MA: Thomson Wadsworth, 9th edition, 2011, chapters 1-2
6. For details of aphasia categories: "Language and the Brain", https://web.stanford.edu/~zwicky/language-and-the-brain-ch4-8.pdf

Course Outcomes: At the end of the course, the students should be able to:

- Have an understanding of exactly what cognitive science is.
- How different fields contribute to the study of the mind.
- Identify the problems that cognitive science seeks to address,
- Gain insights on how cognitive science offers into mental functions (perception, action, memory, learning, problem solving, language, etc.),
- Describe how philosophy, psychology, linguistics, neuroscience, and computer science contribute to cognitive science.

Subject Code	Subject Name (Lab Oriented Theory course)	Category	L	T	P	C
AI23P39	SOFT COMPUTING	PE	2	0	2	3

OBJECTIVES:

- Understand the basics and types of neural networks for supervised and unsupervised learning.
- Learn fuzzy logic principles and apply them to fuzzy decision-making and control systems.
- Genetic algorithm concepts and apply them to optimization problems.
- Explore and apply hybrid systems integrating neural networks, fuzzy systems, and genetic algorithms.
- Apply soft computing techniques to real-world problems like image fusion, optimization, and control systems.

UNIT I	ARTIFICIAL NEURAL NETWORK	9

Fundamental Concept, McCulloch-Pitrs Neuron, Hebb Network. Supervised Learning- Network-Adaptive Linear Neuron (Adaline), Multiple Adaptive Linear Neurons (Madaline). Associative memory Network - Bidirectional Associative Memory (BAM) ,Hopfield Networks, Linear Autoassociacive Memory (LAM). Unsupervised Learning Networks, Kohonen Self-Organizing Feature Maps, Learning Vector Quantization

UNIT II	FUZZY SYSTEMS	9

Introduction-fuzzy logic, Classical Sets and Fuzzy Sets, Classical Relations and Fuzzy Relations, Membership Functions. Defuzzification, Fuzzy Arithmetic and Fuzzy Measures, Fuzzy Decision Making, Fuzzy Logic Control Systems.

UNIT III	GENETIC ALGORITHM	9

Biological Background, Search Technique, Search Space. Terminologies in Genetic Algorithm- Genes, Fitness, Population, Operators- Encoding, Selection, Crossover, Mutation. Problem Solving Using Genetic Algorithm- Maximizing a Function.

UNIT IV	HYBRID SOFT COMPUTING TECHNIQUES	9

Neuro-Fuzzy Hybrid Systems- Characteristics, Adaptive Neuro,Fuzzy Inference System (ANFIS).Genetic Neuro –Hybrid Systems- Back-Propagation Network (BPN). Genetic Fuzzy Rule Based Systems (GFRBSs). Supervised ARTMAP System.

UNIT V	APPLICATIONS	9

Fusion Approach of Multispectral Images with SAR (SyntheticAperrure Radar),Optimization Salesman Problem using Genetic Algorithm Approach, Genetic Algorithm-Based Internet Search Technique, Soft Computing Based Hybrid Fuzzy Controllers.

TOTAL : 45 PERIODS

List of Experiments

1. Implementation of fuzzy control/ inference system
2. Programming exercise on classification with a discrete perceptron
3. Implementation of XOR with backpropagation algorithm
4. Implementation of self organizing maps for a specific application
5. Programming exercises on maximizing a function using Genetic algorithm
6. Implementation of two input sine function
7. Implementation of three input non linear function

Software : Python Hardware : intel computer with 8 GB RAM

Contact Hours :	20
Total Contact Hours :	65

COURSE OUTCOMES:	
CO1	Understand the advanced neural networks for AI applications.
CO2	Understand the fundamentals of fuzzy logic operators and inference mechanisms.
CO3	Learn the functionality of Genetic Algorithms in Optimization problems.
CO4	Use hybrid techniques involving Neural networks and Fuzzy logic.
CO5	Apply soft computing techniques in real world applications.
TEXT BOOKS:	
1	S.N. Sivanandam, S.N. Deepa, Principles of Soft Computing, Third Edition, Wiley India Pvt Ltd, 2019.
2	Roj Kaushik and Sunita Tiwari, Soft Computing-Fundamentals Techniques and Applications, 1st Edition, McGraw Hill, 2018.
REFERENCES:	
1.	Soft Computing And Its Applications By Matthew N. O Sadiku , Philip O. Adebo , Uwakwe C. Chukwu.,2023
2.	Soft Computing Engineering Applications Edited By Pradip Debnath, Binod Chandra Tripathy Copyright 2025
3.	S.Rajasekaran, G.A.Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm, Synthesis and Applications ", PHI Learning Pvt. Ltd., 2017.

Contact Hours : 20

Total Contact Hours : 65

ARTICULATION MATRIX :

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1.	**3**	**3**	**2**	**2**	**2**	**1**			**1**	1	**1**	**3**	**3**	**2**	**1**
2.	**3**	**3**	**2**	**2**	**3**	**1**			**1**	1	**2**	**2**	**2**	**3**	**1**
3.	**3**	**3**	**3**	**3**	**2**	**1**			**1**	1	**2**	**3**	**2**	**3**	**2**
4.	**3**	**3**	**3**	**3**	**3**	**2**	**1**	**1**	**1**	2	**2**	**3**	**3**	**3**	**3**
5.	**3**	**2**	**3**	**2**	**2**	**2**		**2**	**2**	2	**2**	**3**	**3**	**3**	**3**
Average	**3**	**2.8**	**2.6**	**2.4**	**2.4**	**1.4**	**0.2**	**0.6**	**1.2**	1.4	**1.8**	**2.8**	**2.6**	**2.8**	**2**

Subject Code	Subject Name (Lab oriented Theory Course)	Category	L	T	P	C
IT23C31	**SOFTWARE TESTING** (Common to IT, CSE, CSE CS, AIML, AIDS, CSBS, CSD)	PC	2	0	2	3

Objectives:
● To learn the criteria for test cases
● To learn the design of test cases.
● To understand test management and test automation techniques
● To understand test management and test structure group
● To apply test metrics and measurements

UNIT-I	**INTRODUCTION**	6
Testing as an Engineering Activity – Testing as a Process – Testing Maturity Model- Testing axioms – Basic definitions – Software Testing Principles – The Tester‘s Role in a Software Development Organization – Origins of Defects – Cost of defects – Defect Classes – The Defect Repository and Test Design		
UNIT-II	**TEST CASE DESIGN STRATEGIES**	6
Test case Design Strategies – Using Black Box Approach to Test Case Design – Using White Box Approach to Test design – Test Adequacy Criteria – static testing vs. structural testing – code functional testing – Coverage and Control Flow Graphs – Covering Code Logic – Paths – Secured Code Writing – code complexity testing		
UNIT-III	**LEVELS OF TESTING**	6
The need for Levels of Testing – Unit Test – Unit Test Planning – Designing the Unit Tests –Running the Unit tests and Recording results – Integration tests – Designing Integration Tests – Integration Test Planning – Scenario testing – Defect bash elimination System Testing – Acceptance testing – Performance testing – Regression Testing – Internationalization testing – Ad-hoc testing – Alpha, Beta Tests – Testing OO systems – Usability and Accessibility testing – Configuration testing –Compatibility testing .		
UNIT-IV	**TEST MANAGEMENT**	6
People and organizational issues in testing – Organization structures for testing teams – testing services – Test Planning – Test Plan Components – Test Plan Attachments – Locating Test Items – test management – test process – Reporting Test Results – Introducing the test specialist – Skills needed by a test specialist – Building a Testing Group- The Structure of Testing Group.		
UNIT-V	**TEST AUTOMATION**	6
Software test automation – skills needed for automation – scope of automation – design and architecture for automation – requirements for a test tool – challenges in automation – Test metrics and measurements – project, progress and productivity metrics		
Total Contact Hours: 30		

Description of the Experiments	**Total Contact Hours: 30**
1. Demonstrate the working of the following a. constructs: i) do...while ii) while….do iii) if…else iv) switch v) for	
2. Take any system (e.g. ATM system) and study its system specifications and report the various bug	
3. Write the test cases for any known application (e.g. Banking application)	
4. Create a test plan document for any application (e.g. Library Management System)	
5. Study of any testing tool (e.g. Win runner)	
6. Study of any web testing tool (e.g. Selenium)	
7. Study of any bug tracking tool (e.g. Bugzilla, bugbit)	
8. Study of any test management tool (e.g. Test Director)	
9. Study of any open source-testing tool (e.g. Test Link)	

Course Outcomes: At the end of the course the students will be able to
● Design test cases suitable for a software development for different domains
● Identify suitable tests to be carried out
● Prepare test planning based on the document
● Document test plans and test cases designed
● Use automatic testing tools and Develop and validate a test plan

SUGGESTED ACTIVITIES (if any)

- Survey on various Testing technologies
- Activity Based Learning

SUGGESTED EVALUATION METHODS (if Any)

- Assignment problems
- Quizzes
- Class Presentation/Discussion

Text Book(s):
1. Andreas Spillner, Tilo Linz, “Software Testing Foundations“, 5th Edition, O’Reilly Publisher, 2021.
2. Arnon Axelrod, “Complete Guide to Test Automation: Techniques, Practices, and Patterns for Building and Maintaining Effective Software Projects “, Apress Publisher, 1st Edition, September 2018

Reference Books(s) / Web links:
1. Ilene Burnstein, "Practical Software Testing: A Process Oriented Approach", Springer International Edition, December 2010.
2. James Whittaker , Jason Arbon , Jeff Carollo , "How Google Tests Software", 1st Edition, Addision Wesley, 2012
3. Rex Black Erik van Veenendaal, Dorothy Graham , **"**Foundations of Software Testing ISTQB Certification**"** , 3rd Edition, Cengage Publications, 2015

CO-PO-PSO Mapping

PO/PSO CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO 11**	**PO12**	**PSO1**	**PSO 2**	**PSO 3**
IT23C31.1	3	2	3	-	1	-	-	1	2	2	3	3	2	2	2
IT23C31.2	3	2	3	-	2	-	-	-	1	2	2	2	3	2	2
IT23C31.3	3	2	3	-	1	-	-	1	-	2	2	2	2	2	2
IT23C31.4	3	2	3	-	2	-	-	-	1	2	1	1	3	1	2
IT23C31.5	3	2	3	-	1	-	-	1	-	2	2	1	2	1	2
Average	3	2	3	-	1.4	-	-	1	1.3	2	2	1.8	2.4	1.7	2

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation: "-"

Subject Code	Subject Name (Lab Oriented Theory Course)	Category	L	T	P	C
IT23B32	Advanced Web Programming (Common to IT, CSD)	PE	1	0	4	3

Objectives	
•	Understand the fundamentals of React Native and its integration with MERN stack technologies.
•	Learn the basics of Node.js, Express.js, and Next.js to build full-stack applications.
•	Gain hands-on experience in building real-world applications using modern web and mobile development tools.
•	Implement the techniques of integrating backend and front end.
•	Develop and test deployable applications with a focus on asynchronous workflows, REST APIs, and advanced React Native features.

UNIT - I	**React Native Application with MERN**	**4**
Mern Stack, Relevance of MERN, Range of MERN Applications, Selecting Developmental Tools, Setting up MERN Stack Technologies- Integrating Figma with React Native		
UNIT - II	**NodeJs**	**3**
Introduction to Node Js-Installing NodeJs-NodeJs core Modules-Synchrounouus and Asynchronous File Operations – Integrating Nodejs and MangoDB		
UNIT - III	**ExpressJS**	**3**
Introduction to ExpressJs- Introduction to REST API and POSTMAN-Sending HTML and JSON Data Using ExpressJs- Partials in ExpressJs – Quesry Strings in ExpressJs		
UNIT IV	**NextJS**	**3**
Setting up nextjs, Styling the applications, Built-in Next JS Components, Pre rendering and publishing		
UNIT - V	**Generative AI and ChatGPT**	**2**
ChatGPT for Web Design- Prompt Engineering-integrating ChatGPT with React Native		
Contact Hours		**15 Hours**

List of Experiments

1. Build a React Native app to help users manage their personal finances by tracking expenses, incomes, and budgets.

Features:

- User authentication (Sign up, Login, Logout) using Firebase or JWT.
- Add, edit, and delete expense and income entries.
- Categorize transactions (e.g., food, rent, entertainment).
- Visualize spending patterns using charts (use libraries like react-native-chart-kit).
- Sync data with a backend (Node.js/Express.js) for persistence.

2. Create an app similar to Uber Eats or Swiggy for food delivery.

Features:

- User registration and login.
- Display a list of restaurants with their menus.
- Add items to the cart and place orders.
- Track order status (e.g., Pending, Delivered).
- Payment gateway integration using Razorpay or Stripe.

3. Develop an app for online education with video tutorials and quizzes.

Features:

- User authentication and profile management.
- Browse courses and view video content.
- Take quizzes and view results.
- Progress tracking for completed modules.

4. Develop a system to manage employee data, including CRUD operations.

Features:

- REST API to add, update, delete, and retrieve employee records.
- Store employee data in a MongoDB or PostgreSQL database.
- Include fields like name, role, department, and salary.
- Implement role-based access control (e.g., admin, HR).

5. Build the backend for an e-commerce platform.

Features:

- Product management: Add, update, delete, and view products.
- User registration and authentication.
- Shopping cart and order management.
- Payment gateway integration (e.g., Stripe, PayPal).

6. Build an API to fetch and display weather data.

Features:

- Fetch real-time weather data using a third-party API (e.g., OpenWeatherMap).
- Store user preferences for location-based weather.
- Provide forecast data for multiple cities.
- Cache weather data to reduce API calls.

7. Build a Library Management System using Express.js with synchronous workflows.

Features:

- CRUD operations for books and members.
- View available books and their details.
- Allow users to issue and return books.
- Generate static reports for issued/available books.

8. Build an Asynchrounous real-time notification service for a task management app.

Features:

- Create tasks and assign deadlines.
- Send notifications to users when deadlines are near.
- Use WebSocket or socket.io for real-time notifications.
- Store tasks and notifications in a MongoDB database.

9. Develop a fully functional e-commerce platform to sell products. The project will leverage Next.js features like SSR, static generation, and API routes to enhance user experience and improve search engine visibility.

10. Build a simple To-Do List app to test and deploy while focusing on core features and workflows.

Features:

- Add, edit, delete, and mark tasks as complete.
- Store tasks locally using AsyncStorage.
- Include basic navigation using react-navigation.

Testing Focus:

- **Unit Testing**: Test individual components like TaskItem, AddTaskForm using **React Native Testing Library**.
- **Integration Testing**: Test the navigation and interaction between screens.
- **End-to-End Testing**: Automate adding, editing, and deleting tasks using **Detox**.

Generate APK and AAB for Android and web deployement.

Contact Hours : 60

Total Contact Hours : 75

Course Outcomes :

On completion of the course, the students will be able to

- Build and deploy React Native applications using the MERN stack.
- Develop robust server-side applications with Node.js and Express.js.
- Create Next.js-based web applications with pre-rendering and publishing features.
- Integrate Generative AI and ChatGPT into React Native projects.
- Demonstrate skills in testing, debugging, and deploying full-stack applications.

Suggested Activities

- **Coding Competitions**:
  - Organize a coding competition where students solve real-world problems using the MERN stack.
- **Case Studies**:
  - Analyze and present solutions for existing applications, focusing on their architecture and implementation.
- **Code Reviews**:
  - Peer review sessions to improve coding standards and ensure best practices.

Suggest Evaluations Methods
1. **Project Evaluation**: • Assess the progress of individual and group projects throughout the semester. • Evaluate based on functionality, design, code quality, and presentation. **2. Final Project Presentation**: • Assess the final application based on completeness, innovation, deployment, and documentation. **3. Viva Voce**: • Oral examinations to test conceptual understanding and problem-solving abilities.

Text Books
1. Martin Krause, The Complete Developer Master Full Stack, No Scratch Press, Google Books, 2024.
2. Gaurav Garg, Full Stack Web Development With Next.js And Express.js, Amazon, Entrustech Inc , 2023.
References
1. Shama Hoque, Full-Stack React Projects: Modern web development using React 16, Node, Express, and MongoDB, Packt Publishers, 2018.

CO-PO-PSO Mapping

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2	PSO 3
IT23B32.1	3	3	-	2	3	1	-	-	-	-	2	3	1	2	1
IT23B32.2	3	3	-	2	3	1	-	-	-	-	2	3	1	2	1
IT23B32.3	3	3	-	2	3	1	-	-	-	-	2	3	1	2	1
IT23B32.4	3	3	-	2	3	1	-	-	-	-	2	3	1	2	1
IT23B32.5	3	3	-	2	3	1	-	-	-	-	2	3	1	2	1
Average	**3**	**3**	**-**	**2**	**3**	**1**	**-**	**-**	**-**	**-**	**2**	**3**	**1**	**2**	**1**

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation: "-"

Subject Code	Subject Name (Lab Oriented Theory Course)	Category	L	T	P	C
IT23B33	DevOps (Common to IT, AIML,AIDS,CSE, CSE CS,CSD,CSBS)	PE	2	0	2	3

Objectives:
• Understand the principles and practices of DevOps.
• Gain proficiency in using DevOps tools like Git, Jenkins, Docker, Kubernetes, and Helm.
• Learn to implement CI/CD pipelines for automation and efficiency.
• Explore advanced topics like DevSecOps, security testing, and reducing deployment downtime.
• Apply DevOps concepts to real-world applications and projects.

Unit – I	**Introduction to DevOps**	6
What is Devop- DevOps Roots and Origin- Why Is DevOps Required- The DevOps Lifecycle and Workflow- DevOps Practices- DevOps Tools		
UNIT-II	**DevOps CI/CD Pipeline**	6
Managing Your Source Code with Git - Overviewing Git and its principal command lines- Understanding the Git process and Gitflow pattern- Continuous Integration and Continuous Delivery- CI/CD principles- Creating a CD pipeline – the release- Using GitLab CI- Using Jenkins for CI/CD implementation- Deploying Infrastructure as Code with CI/CD Pipelines-		
UNIT-III	**Microservices with Docker and Kubernetes**	6
Containerizing Your Application with Docker- Installing Docker- An overview of Docker's elements- Building and running a container on a local machine- Using Docker for running command-line tools- Docker Compose- Installing Kubernetes- Installing the Kubernetes dashboard- Using Helm as a package manager- Creating a CI/CD pipeline for Kubernetes with Azure Pipelines		
UNIT-IV	**More on DevOps**	6
Security in the DevOps Process with DevSecOps- Testing Azure infrastructure- Writing InSpec tests- Reducing Deployment Downtime- Blue-green deployment concepts and patterns- DevOps for Open Source Projects- pull requests- Sharing binaries- GitHub Actions- Analyzing code with SonarCloud		
UNIT-IV	**DevOps Best Practices**	6
Choosing the right tool- Writing all your configuration in code- Designing the system architecture- Building a good CI/CD pipeline- Shifting security left with DevSecOp- Applying web security and penetration testing with ZAP- Running performance tests with Postman		
Contact Hours: 30		

List of Experiments
1. Exploring Git Commands through Collaborative Coding.
2. Implement GitHub Operations
3. Exploring Git Commands through Collaborative Coding.
4. Implement GitHub Operations
5. Applying CI/CD Principles to Web Development Using Jenkins, Git, and Local HTTP Server
6. Exploring Containerization and Application Deployment with Docker
7. Applying CI/CD Principles to Web Development Using Jenkins, Git, using Docker Containers
8. Demonstrate Container Orchestration using Kubernets.
9. Create the GitHub Account to demonstrate CI/CD pipeline using Cloud Platform.
10. Reduce the Downtown using Blue-Green Deployment
11. Testing Project with ZAP and Postmen
Contact Hours : 30
Total Contact Hours : 60

Course Outcomes: Students will be able to
• Apply DevOps principles and lifecycle workflows to software development.
• Build and manage CI/CD pipelines for application development and deployment.
• Utilize tools like Docker and Kubernetes for containerization and orchestration.
• Implement DevSecOps practices for secure and reliable deployments.
• Demonstrate advanced DevOps practices such as blue-green deployment and testing.

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic

- Lab assessment:
- Quizzes and Assignments
- Group project

SUGGESTED ACTIVITIES **Case Study:**

- Evolution of DevOps in industry-leading companies. Group discussion on the DevOps lifecycle and workflow.
- Code walkthrough: Implementing a blue-green deployment strategy. Conducting security analysis using SonarCloud and GitHub Actions and walkthrough the code to the group.

Text Book(s):
1. Mark Reed, " DevOps The ultimate beginners guide to learn DevOps step by-step", Amazon,2019.
2. Craig Berg , “DevOps For Beginners: A Complete Guide To DevOps Best Practices, Second edition, Amazon , 2020.
3. Mikael Krief, "Learning Devops" , Second Edition, Packt Publisher, 2022.

Reference Books(s) / Web links:
1. DevOps Tutorial | Microsoft Azure
2. DevOps Fundamentals- Defining DevOps Principles - GitHub - GitHub Resources

CO-PO-PSO Mapping

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT23B33.1	3	2	2	–	3	–	–	2	3	2	–	–	2	2	–
IT23B33.2	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3
IT23B33.3	3	3	3	3	3	2	3	3	3	3	2	3	3	3	3
IT23B33.4	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3
IT23B33. 5	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3
Average	3	2.8	2.8	3	3	2	3	2.8	3	2.8	2.75	2.8	2.6	2.8	3

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation: “-“

Subject Code	Subject Name	Category	L	T	P	C
IT23B34	Advanced Java Programming (Common to IT, CSD)	PE	3	0	0	3

Objectives	
•	To understand the concepts of Multithreading.
•	To establish a connection between Java and database.
•	To learn and practice the Java servlets concepts.
•	To emphasis working architecture of Java Server Pages.
•	To understand the Model-View-Controller architecture implementing using Spring.

UNIT - I	Multithreading	9
Introduction to Threads- Thread Life Cycle- Thread Creation- Synchronization- Thread Safety and Deadlock.		
UNIT - II	**Networking and Java Database Connectivity (JDBC)**	**9**
Basics of networking- socket programming-Simple chat application - Establishing database connections -Executing SQL queries- PreparedStatement and CallableStatement.		
UNIT - III	**Java Servlets**	**9**
Introduction to Servlets- Servlet life cycle- Servlet containers-Servlet Configurations and Parameters-Initialization parameters- Context parameters-Handling Form Data- GET and POST methods- HTML forms and servlets.		
UNIT IV	**Java Server Page (JSP)**	**9**
Introduction to JSP-JSP life cycle-JSP expressions and declarations-Directives and Actions-Page directives-JSP actions and implicit objects-JSP Tag Libraries-Standard and Custom Tag Libraries-Expression Language (EL).		
UNIT - V	**Model-View-Controller (MVC) Architecture**	**9**
MVC Design Pattern-Separation of concerns-Implementing MVC in Java web applications- Introduction to Spring-Dependency Injection (DI) and Inversion of Control (IoC)-Spring AOP (Aspect-Oriented Programming)- Spring MVC -Configuring Spring MVC-Handling web requests.		
Contact Hours		**45 Hours**

Course Outcomes :	
On completion of the course, the students will be able to	
✓	Create programs to implement multithreading concepts
✓	Establish a connection between Java and Database.
✓	Develop a Java Servlets program using GET and POST methods
✓	Code, Create to implement Java Server page with simple applications.
✓	Develop a MVC applications with Spring MVC.

Suggested Activities
1. Conduct Quizzes 2. Project based learning 3. Invite Speakers from Industry to show real time applications
Suggest Evaluations Methods
1. Assign Individuals project and Team based projects to test their understand level. 2. Mini Project to implement JSP and MVC Spring 3. Conduct Quizzes.
Text Books:
1. Herbert Schildt, Dr. Danny Coward " Java: The Complete Reference", Thirteenth Edition, McGraw-Hill Publisher, January 2024
2. John Carnell " Spring Micro services in Action", Manning Publisher, July 2017
3. Kathy Sierra, Bryan Basham, Bert Bates ," Head First Servlets and JSP ", Publisher: O'Reilly Media, Inc, March 2008
References:
1. https://www.geeksforgeeks.org/multithreading-in-java/
2. https://www.javatpoint.com/example-to-connect-to-the-mysql-database
3. https://www.javatpoint.com/servlet-tutorial
4. https://www.tutorialspoint.com/jsp/index.htm
5. https://www.geeksforgeeks.org/mvc-framework-introduction/
6. https://www.javatpoint.com/spring-tutorial

CO-PO-PSO Mapping

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT23B34.1	3	3	-	2	3	1	-	-	-	-	2	3	1	2	1
IT23B34.2	3	3	-	2	3	1	-	-	-	-	2	3	1	2	1
IT23B34.3	3	3	-	2	3	1	-	-	-	-	2	3	1	2	1
IT23B34.4	3	3	-	2	3	1	-	-	-	-	2	3	1	2	1
IT23B34. 5	3	3	-	2	3	1	-	-	-	-	2	3	1	2	1
Average	3	3	-	2	3	1	-	-	-	-	2	3	1	2	1

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation: "-"

Subject Code	Subject Name (Theory Course)	Category	L	T	P	C
IT23C12	Software Project Management (Common to IT, CSE, AIDS, CSD)	PE	3	0	0	3

Objectives:
• This course describes the key aspects of a software project.
• It introduces the basic principles of Engineering Software Projects. Most, if not all, students' complete projects as part of assignments in various courses undertaken.
• The course provides an understanding of the purpose, methods and benefits of process management by exposing the student to the concepts, practices, processes, tools and techniques used in process management for software development.

UNIT-I	**SOFTWARE DEVELOPMENT PROCESS**	**9**
Defining of Software Development Process - Process - Tailoring the Process – Improving the process discipline - Need for implementing discipline. Software Production Process - Identify the Software Model - Software Process Models : Waterfall Model, Prototyping Model, RAD Model, Incremental Model, Spiral Model, Component Assembly Model - Software Life Cycle.		
UNIT-II	**SOFTWARE PROJECT MANAGEMENT**	**9**
Introduction to Software Project Management- Software Projects – ways of categorizing software projects – problems with software projects – Project Life Cycle– Management -Setting objectives –Stakeholders – Project Team- Step-wise : An overview of project planning -project Evaluation –Selection Of Appropriate Project Objectives- Software Effort Estimation Techniques, Function Point Analysis-Object Point-COCOMO.		
UNIT-III	**SOFTWARE PLANNING**	9
Activity planning– project schedules – sequencing and scheduling projects – Network planning model – AON and AOA-identifying critical activities-Crashing And Fast Tracking-,Risk management—Categories , Risk planning, Management and Control – Evaluating risks to the schedule. PERT- Resource Allocation, Monitoring and Tracking – Monitoring and control – allocation – identifying resource requirements – scheduling resources – creating critical paths – publishing schedule – cost schedules- sequence schedule.		
UNIT-IV	**SOFTWARE SPECIFICATIONS**	9
Product Specifications - Defining the Final Product - Data Flow Diagram, Data Dictionary, Structured English, Decision Trees, Decision Tables - Feasibility Study. Software Testing : Test Plan - Development Testing : Verification and Validation - General Testing Methods : White Box and Black Box Testing - Unit Testing – System Integration Testing - Validation Testing - System testing.		
UNIT-V	**SOFTWARE QUALITY**	9
Software Quality - Quality Measures - FURPS - Software Quality Assurance – Software Reviews - Format Technical Review (FTR) Formal Approaches to SQA – Software Reliability - Introduction to SQA - The Software Quality Assurance Plan – Formal approaches to SQA - Clean room Methodology.		
Total Contact Hours:45		

Course Outcomes:
• Apply project management concepts and techniques to an IT project.
• Identify issues that could lead to IT project success or failure.
• Explain project management in terms of the software development process.
• Describe the responsibilities of IT project managers.
• Apply project management concepts through working in a group as team leader
SUGGESTED ACTIVITIES ● Problem solving sessions ● Activity Based Learning ● Implementation of small module
SUGGESTED EVALUATION METHODS ● Tutorial problems ● Assignment problems ● Quizzes ● Class Presentation/Discussion
Text Book(s):
1.Bob Hughes, Mike Cotterell and Rajib Mall, "Software Project Management", Fifth Edition, Tata McGraw Hill, New Delhi, 2017.
2.Pressman R S, "Software Engineering - A Practitioner,,s Approach", 9 th Edition, Tata McGrawHill Book Company, 2023.
Reference Books(s) / Web links:
1. Gerardus Blokdyk, **"**Software Project Management: A Complete Guide", 5STARCooks ,2020
2. Harold Kerzner, "Project Management: A Systems Approach to Planning, Scheduling, and Controlling**",** 13th Edition, Wiley, 2022
3. Project Management Institute (PMI), " A Guide to the Project Management Body of Knowledge**"**, Seventh Edition, Project Management Institute, 2021

CO-PO-PSO Mapping

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO12	PSO1	PSO 2	PSO 3
IT23C12.1	1	2	3	-	1	-	-	1	2	2	3	3	2	2	2
IT23C12.2	2	1	2	-	2	-	-	-	1	2	2	2	3	2	1
IT23C12.3	2	2	2	-	1	-	-	1	-	2	2	2	2	2	2
IT23C12.4	1	2	3	-	2	-	-	-	1	2	1	1	3	1	2
IT23C12.5	2	2	3	-	1	-	-	1	-	2	2	1	2	1	2
Average	1.7	1.8	2.6	-	1.4	-	-	1	1.3	2	2	1.8	2.4	1.7	1.8

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation: "-"

Subject Code	Subject Name (Theory course)	Category	L	T	P	C
IT23C18	Agile Methodologies (Common to IT,CSD)	PE	3	0	0	3

Objectives:
• To provide students with a theoretical as well as practical understanding of agile software development practices and how small teams can apply them to create high-quality software.
• To provide a good understanding of software design and a set of software technologies and APIs.
• To do a detailed examination and demonstration of Agile development and testing techniques.
• To understand the benefits and pitfalls of working in an Agile team.
• To understand Agile development and testing.

UNIT-I	**AGILE METHODOLOGY**	**9**
Theories for Agile Management - Management Accounting for Systems - TOC in Software Production- Dealing with Uncertainty - Software Production Metrics - Agile Project Management - Agile Project Planning- The Agile Manager's New Work.		
UNIT-II	**DEVELOPMENT MANAGEMENT**	**9**
Agile Development Management - Software Resource Planning - Governing Rules- Staffing Decisions- Management in the IT Department- Product Management- Financial Metrics for Software Services		
UNIT-III	**AGILE METHODS**	9
Production Metrics for Traditional Methods- Financial Metrics in Traditional Methods - Production Metrics in FDD - Project Management with FDD- FDD Process Elements- Financial Metrics in FDD		
UNIT-IV	**PRODUCTION METRICS**	9
Production Metrics in Extreme Programming - XP Process Elements- Financial Metrics in XP- Production Metrics in Scrum- Scrum Process Elements		
UNIT-V	**COMPARISON OF METHODS**	9
Devil's Advocacy- States of Control and Reducing Variation- Comparison of Production Metrics- Applicability of Agile Methods		
		Total Contact Hours: 45

Course Outcomes:
Realize the importance of interacting with business stakeholders in determining the requirements for a software system
Perform iterative software development processes: how to plan them, how to execute them.
Develop techniques and tools for improving team collaboration and software quality.
Perform Software process improvement as an ongoing task for development teams.
Show how agile approaches can be scaled up to the enterprise level.

SUGGESTED ACTIVITIES (if any) (UNIT/ Module Wise) – Could suggest topic ● Problem solving sessions ● Survey on various methods. ● Activity Based Learning ● Implementation of small module
SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic ● Tutorial problems ● Assignment problems ● Quizzes ● Class Presentation/Discussion
Text Book(s):
1. David J. Anderson and Eli Schragenheim, "Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results", Prentice Hall, 2003.
2. Hazza and Dubinsky, "Agile Software Engineering, Series: Undergraduate Topics in Computer Science", Springer, 2009.
Reference Books(s) / Web links:
1.Craig Larman, "Agile and Iterative Development: A Manager's Guide", Addison-Wesley, 2004.
2. Kevin C. Desouza, "Agile Information Systems: Conceptualization, Construction, and Management", Butterworth-Heinemann, 2007.

CO-PO-PSO Mapping

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT23C18.1	3	2	3	-	1	-	-	1	2	2	3	3	2	2	2
IT23C18.2	3	2	2	-	2	-	-	-	1	2	2	2	3	2	2
IT23C18.3	3	2	2	-	1	-	-	1	-	2	2	2	2	2	2
IT23C18.4	3	2	3	-	2	-	-	-	1	2	1	1	3	1	2
IT23C18.5	3	2	3	-	1	-	-	1	-	2	2	1	2	1	2
Average	3	2	2.6	-	1.4	-	-	1	1.3	2	2	1.8	2.4	1.7	2

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation: "-"

Subject Code	Subject Name (Theory course)	Category	L	T	P	C
CR23A11	Security Assessment and Risk Analysis	PE	3	0	0	3

Objectives:

- Understand the fundamental principles of information security and the threat landscape.
- Understand various security assessment methodologies.
- Develop the ability to identify, assess, and manage information security risks through risk profiling and risk management concepts.
- Learn risk evaluation and mitigation strategies.
- Gain an introduction to common security frameworks and standards (NIST CSF and ISO 27001).

UNIT I	**INTRODUCTION**	**9**

Fundamentals of information security- CIA triad: Confidentiality, Integrity, Availability. Threat landscape overview: Common security threats, actors, and motivations. Introduction to vulnerability management.

UNIT II	**SECURITY ASSESSMENT METHODOLOGIES**	**9**

Security assessment methodologies: Penetration testing - Vulnerability scanning - Security audits. Penetration testing types: White-box, black-box, grey-box testing. Vulnerability scanning tools and their functionalities.

UNIT-III	**RISK ANALYSIS AND RISK MANAGEMENT**	**9**

Risk Profiling - Formulating the Risk - Risk Exposure Factors. Risk management concepts: Risk identification-assessment - mitigation and acceptance. Case Study - Work in groups to develop a risk register for a fictional company, identifying potential security risks, their likelihood, and impact.

UNIT IV	**RISK ASSESSMENT AND ANALYSIS**	**9**

Risk Evaluation and mitigation strategies - Reports and Consulting - Risk Assessment Techniques. Project: Conduct a risk assessment for a specific department within your organization (if applicable) or a chosen cloud service platform.

UNIT-V	**SECURITY FRAMEWORKS AND STANDARDS**	**9**

Introduction to security frameworks and standards (NIST CSF, ISO 27001) -Aligning security assessments and risk analysis with frameworks - Implementing security controls based on identified risks.

Total Contact Hours : 45

Course Outcomes: On completion of course you will be able to

Understand the CIA triad and identify common security threats, actors, and their motivations.

Distinguish between penetration testing, vulnerability scanning, and security audits.

Describe the four main risk management concepts: identification, assessment, mitigation, and acceptance

Explain risk profiling and risk evaluation techniques.

Summarize the purpose and benefits of security frameworks like NIST CSF and ISO 27001

Suggested Activities:

Quizzes

Class presentation/Discussion

Group Presentation

Reference Books (s)/Web links:	
1.	William Stallings, “Cryptography and Network Security”, Seventh Edition, Pearson, 2017
2.	Mark Talabis and Jason Martin, "Information Security Risk Assessment Toolkit: Practical Assessments through Data Collection and Data Analysis", Syngress, 2012
3.	Thomas R Peltier, "Information Security Risk Analysis", First Edition, Auerbach Publications, 2001
4.	Evan Wheeler, “Security Risk Management: Building an Information Security Risk Management Program from the Ground Up”, First Edition, Syngress, 2011
5.	Jon Erickson, "Hacking: The Art of Exploitation", Second Edition, No Starch Press, 2008

CO-PO-PSO Matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CR23A11.1	3	3	-	2	2	2	1	2	-	1	-	2	3	3	2
CR23A11.2	2	3	-	3	3	-	-	-	-	1	-	1	3	3	2
CR23A11.3	3	3	3	3	3	2	1	2	-	-	-	2	3	3	2
CR23A11.4	3	2	3	3	3	-	2	2	-	-	-	1	3	3	2
CR23A11.5	3	3	2	3	3	2	2	3	-	-	-	2	3	3	2
Average	2.8	2.8	2.6	2.8	2.8	2	1.5	2.25	-	1	-	1.6	3	3	2

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (low) 2: Moderate (Medium) 3: Substantial (High) No correlation:”-“

Course Code	Course Name	Category	L	T	P	C
CS23A11	Malware Detection and Analysis	**PE**	**3**	**0**	**0**	**3**

Objectives:
• To introduce the malware components and behaviour
• To detect and analyze malware affected documents.
• To introduce malware fundamentals and basic analysis.
• To enable to identify and analyze various malware types by static analysis.
• To enable to identify and analyze various malware types by dynamic analysis.

UNIT I	**MALWARE COMPONENTS AND FUNCTIONALITY**	**9**
Malware Components-Payload, Packers, Persistence, Communication, Propagation, Armoring ,Stealth, Distribution Mechanisms, Downloaders and Launchers, Backdoors, Credential Stealers, Persistence Mechanisms, Handles, Mutexes, Privilege Escalation, Covert malware launching- Launchers, Process Injection, Process Replacement, Hook Injection, Detours, APC injection		
UNIT II	**MALWARE DETECTION AND REVERSE ENGINEERING**	**9**
Antivirus Engines-Main Components, Signatures and Signature Modules, File Scanner, Unpacker Module, Memory Scanner, Hook and Rootkit detection Modules, Next Generation Antiviruses, Malware Sandbox Internals, Reverse engineering malicious code - Identifying malware passwords - Bypassing authentication - Advanced malware analysis: Virus, Trojan and APK Analysis - Reverse Engineering Tools: IDA Pro and OLLYDBG		
UNIT-III	**BASIC MALWARE ANALYSIS**	**9**
Objective of Malware Analysis, Malware Analysis techniques, Types of Malware, General Rules for Malware Analysis, Antivirus scanning, Hashing, Finding Strings, Packed and Obfuscated Malware , Portable Executable File Format, Linked Libraries and Functions, Static Analysis tools, Virtual Machines and their usage in malware analysis, Sandboxing, Basic dynamic analysis, Malware execution, Process Monitoring, Viewing processes, Registry snapshots.		
UNIT IV	**MODERN MALWARE STATIC ANALYSIS**	**9**
Levels of Abstraction, Reverse-Engineering, The x86 Architecture, Simple Instructions, The Stacks, Conditionals, Branching, Rep Instructions, Disassembly, Global and local variables, Arithmetic operations, Loops, Function Call Conventions, C Main Method and Offsets. Portable Executable File Format, The PE File Headers and Sections, IDA Pro, Function analysis, Graphing, The Structure of a Virtual Machine, Analyzing Windows programs, Anti-static analysis techniques, obfuscation, packing, metamorphism, polymorphism		
UNIT-V	**MODERN MALWARE DYNAMIC ANALYSIS**	**9**
Live malware analysis, dead malware analysis, analyzing traces of malware, system calls, api calls, registries, network activities. Anti-dynamic analysis techniques, VM detection techniques, Evasion techniques, , Malware Sandbox, Monitoring with Process Monitor, Packet Sniffing with Wire shark, Kernel vs. User-Mode Debugging, OllyDbg, Breakpoints, Tracing, Exception Handling, Patching		
	Total Contact Hours : 45	

Course Outcomes: On completion of course you will be able to	
• Understand the various components of malware analysis and their functionalities.	
• Understand the malware detecting methods and reverse engineering.	
• Understand the various concepts of malware analysis and their technologies used.	
• Possess the skills necessary to carry out independent analysis of modern malware samples using both static and dynamic analysis techniques	
• To be able to safely analyze, debug, and disassemble any malicious software by malware analysis	
Textbooks:	
1	Michael Sikorski and Andrew Honig, "Practical Malware Analysis" by No Starch Press, 2012.
2.	Abhijit Mohanta, Anoop Saldanha, Malware Analysis and Detection Engineering a Comprehensive Approach to Detect and Analyze Modern Malware, 2020, 1st edition, Apress .
3.	M. Sikorski and A. Honig, Practical Malware Analysis: The Hands-on Guide to Dissecting Malicious Software. 2012, 1st edition, No Starch Press.
Reference Books (s)/Web links:	
1	Monnappa K A, Learning Malware Analysis- Explore the concepts, tools, and techniques to analyze and investigate Windows malware, 2018, 1st edition, Packt Publishing.
2	Ken Dunham, Shane Hartman, Manu Quintans, Jose Andre Morales, Tim Strazzere, "Android Malware and Analysis",CRC Press, Taylor & Francis Group, 2015.
3	Victor Marak, "Windows Malware Analysis Essentials" Packt Publishing, O'Reilly, 2015.

CO - PO – PSO matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CS23511.1	2	1	1	1	-	1	-	1	-	-	1	-	2	2	2
CS23511.2	2	1	1	1	-	1	-	1	-	-	1	-	2	2	2
CS23511.3	2	1	1	1	-	1	-	1	-	-	1	-	2	2	2
CS23511.4	2	3	2	2	2	1	-	-	--	-	-	-	2	2	2
CS23511.5	2	3	2	2	2	1	-	-	--	-	-	-	2	2	2
Average															

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3:Substantial (High) No correlation: "-"

Subject Code	Subject Name (Lab Oriented Theory course)	Category	L	T	P	C
CR23A31	Ethical Hacking and Security	PE	2	0	2	3

Objectives:	
●	To understand the ethical hacker's role, the hacking methodology, and the legal boundaries distinguishing ethical from malicious hacking.
●	To identify system weaknesses, network vulnerabilities, and use scanning tools to find security gaps.
●	To understand using ethical hacking tools and techniques to simulate real-world attacks for defensive purposes.
●	To learn how to prioritize risks, recommend security measures and report vulnerabilities.
●	To understand social engineering tactics, zero-day vulnerabilities.

UNIT I	INTRODUCTION	6
Overview of Ethical Hacking- Importance of ethical hacking for Businesses-Key concepts of Ethical Hacking-Difference between Ethical Hacking and Malicious Hacking-Most used tools in Ethical Hacking Incidents(NMAP, Metasploit)-Ethical hacking challenges and their solutions		
UNIT II	**NETWORK VULNERABILITIES AND VARIOUS SCANNING TOOLS**	**6**
Overview of Network vulnerability scanning- Types of network vulnerability scanning-Key features of network vulnerability scanner-Network vulnerability scanning vs network scanning- Network scanning tools(Burp Suite)		
UNIT-III	**ETHICAL HACKING TOOLS AND TECHNIQUES**	**6**
Overview, Tools and Techniques in Ethical Hacking (Metasploit Framework, Nessus, Wireshark, Burp Suite, Nmap, John-the-Ripper, OWASP Zap.		
UNIT IV	**RISK ASSESSMENT AND TYPES OF SYSTEM HARDENING**	**6**
Overview, Types of system hardening (Network hardening, Server hardening, Application hardening, Database hardening, Operating system hardening), Types of Security Risk assessments (Physical security assessment, IT security assessment, Data security assessment, Application security assessment, Insider Threat assessment)		
UNIT-V	**SOCIAL ENGINEERING AND ZERO DAY ATTACKS**	**6**
Overview of Social Engineering and zero day attacks, Impact of social Engineering and zero day attacks, Prevention and mitigation techniques, Best practices for protecting against social engineering and zero day attacks.		
Total Contact Hours: 30		

List of Experiments		
1	Conduct a basic penetration test using Metasploit to exploit a known vulnerability in a controlled environment.	
2	Use NMAP to scan a network and identify open ports and services.	
3	Perform a web vulnerability scan using Burp Suite and document the identified vulnerabilities and their potential impacts.	
4	Perform a vulnerability scan using Nessus and generate a detailed report on the findings, including recommended remediation steps.	
5	Conduct a web application security test using OWASP ZAP. Document vulnerabilities and provide remediation recommendations.	
6	Assess the security of a sample application and provide a detailed report on vulnerabilities and recommended hardening measures.	
7	Perform a risk assessment on a sample IT system and present a risk management plan.	
8	Perform Social Engineering attack	
9	View and capture network traffic using Wireshark	
10	Explore dig tool for vulnerabilities	
Contact Hours :		**30**
Total Contact Hours :		**60**

Course Outcomes: On completion of course you will be able to
• Grasp Core Ethical Hacking Concepts includes exploring the ethical hacker's role, the hacking methodology and the legal boundaries of ethical hacking.
• Learn in detail about common system weaknesses, network vulnerabilities, and various scanning tools to pinpoint security gaps
• Able to Understand ethical hacking tools and techniques
• Gain knowledge in risk assessment and types of system hardening
• Understand topics like social engineering tactics, zero-day vulnerabilities, and keeping abreast of industry best practices.

Suggested Activities:	
●	Code implementing sessions in NMAP, Metasploit, Burp Suite
●	Mini projects

Textbooks (s)/Web links:	
1.	Jon Erickson,"The Art of Exploitation", 2nd Edition, No Starch Press, 2017
2.	Dafydd Stuttard ,"Web Application Hacker's Handbook: Finding and Exploiting Security Flaws",2nd edition, John Wiley, 2011
3	J. Thomas," Mastering Ethical Hacking",1st Edition, TheHackStore, 2023

CO-PO-PSO Matrices of course

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CR23A31.1	3	2	1	2	2	2	-	3	1	2	-	2	3	2	1
CR23A31.2	3	3	2	3	3	1	1	2	2	2	-	3	3	3	2
CR23A31.3	2	3	3	3	3	2	-	2	2	3	-	3	3	3	3
CR23A31.4	2	3	2	3	2	2	-	3	2	2	-	3	3	3	2
CR23A31.5	3	3	2	3	2	2	2	3	2	2	1	3	3	2	3
Average	2.6	2.8	2	2.8	2.4	1.8	1.5	2	2.6	2.2	1	2.8	3	13	2.2

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (low) 2: Moderate (Medium) 3: Substantial (High) No correlation:"-"

Subject Code	Subject Name (Lab Oriented Theory course)	Category	L	T	P	C
CR23A32	Digital and Mobile Forensics	PE	2	0	2	3

Objectives:

- To understand basic digital forensics and techniques.
- To understand digital crime and investigation.
- To understand how to be prepared for digital forensic readiness.
- To understand and use forensics tools for Android devices.
- To understand and use Anti Forensics.

UNIT I	**INTRODUCTION**	**6**

Forensic Science – Digital Forensics – Digital Evidence – The Digital Forensics Process: Introduction – The Identification Phase – The Collection Phase – The Examination Phase – The Analysis Phase – The Presentation Phase.

UNIT II	**DIGITAL CRIME AND INVESTIGATION**	**6**

The International Legal Framework of Cybercrime Law - Digital Crime – Substantive Criminal Law – General Conditions – Offenses – Investigation Methods for Collecting Digital Evidence – International Cooperation to Collect Digital Evidence

UNIT-III	**DIGITAL FORENSIC READINESS**	**6**

Introduction – Law Enforcement versus Enterprise Digital Forensic Readiness – Rationale for Digital Forensic Readiness – Frameworks, Standards and Methodologies – Enterprise Digital Forensic Readiness – Challenges in Digital Forensics

UNIT IV	**ANDROID FORENSICS**	**6**

Android basics – Key Codes – ADB – Rooting Android – Boot Process – File Systems – Security – Tools – Android Forensics – Forensic Procedures – ADB – Android Only Tools – Dual Use Tools – Oxygen Forensics – MobilEdit – Android App Decompiling

UNIT-V	**SQLITE DATABASE FORENSICS AND ANTI FORENSICS**	**6**

Sqlite Database Forensics: Relational Databases - Other Viewers - Anti Forensics: Introduction - Steganography – Cryptography - Password Cracking.

Total Contact Hours : 30

List of Experiments

1	Installation of Sleuth Kit on Linux. List all data blocks. Analyze allocated as well as unallocated blocks of a disk image.
2	Data extraction from call logs using Sleuth Kit.
3	Data extraction from SMS and contacts using Sleuth Kit.
4	Extract installed applications from Android devices.
5	Extract diagnostic information from Android devices through the adb protocol.
6	Generate a unified chronological timeline of extracted records,
7	Implement the sql query database and to handle sqlite in browser
8	Hide InvisibleSecrets in the initial screen using Steganography

Contact Hours :	**30**
Total Contact Hours :	**60**

Course Outcomes: On completion of course you will be able to
Have knowledge on digital forensics.
Know about digital crime and investigations.
Be forensic ready
Investigate, identify and extract digital evidence from Android devices.
Know about Anti Forensics.
Suggested Activities:
Assignment problems, Quiz.
Class presentation/Discussion
Textbooks:
Andre Arnes, "Digital Forensics", Wiley, 2018.
Chuck Easttom, "An In-depth Guide to Mobile Device Forensics", First Edition, CRC Press, 2022.
Reference Books (s)/Web links:
Vacca, J, Computer Forensics, Computer Crime Scene Investigation, 2nd Ed, Charles River Media, 2005, ISBN: 1-58450-389.
Dejay, Murugan, "Cyber Forensics", 1st Edition, Oxford, 2018
Rohit, Oleg, Mahalik, Satish, "Practical Mobile Forensics", 4th Edition, Packt, 2020

CO-PO-PSO Matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CR23A32.1	3	2	2	3	3	-	2	3	-	-	2	3	3	2	2
CR23A32.2	2	3	3	2	3	2	2	3	2	2	-	3	3	3	2
CR23A32.3	3	3	2	3	3	-	-	3	2	-	3	3	3	2	3
CR23A32.4	3	3	3	3	3	2	-	3	-	2	-	3	3	3	3
CR23A32.5	2	2	3	2	3	-	2	3	-	-	-	3	2	3	2
Average	2.6	2.6	2.6	2.6	3	2	2	3	2	2	2.5	3	2.8	2.6	2.4

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (low) 2: Moderate (Medium) 3: Substantial (High) No correlation:"-"

Subject Code	Subject Name (Lab Oriented Theory Course)	Category	L	T	P	C
CR23A34	Security and Privacy in Cloud	PC	2	0	2	3

Objectives:

- To learn the fundamentals of Cloud Computing.
- To learn the infrastructure security in cloud environment.
- To learn the cloud application.
- To learn the data life cycle and privacy in cloud.
- To learn the cloud privacy and risk management.

UNIT-I	FUNDAMENTALS OF CLOUD CONCEPTS	6

Cloud Computing-Cloud computing technology components, Cloud services delivery, Cloud Deployment Model, Key drivers for adopting the cloud.

UNIT-II	INFRASTRUCTURE SECURITY	6

Infrastructure Security: The Host Level-The Network Level, Ensuring Data Confidentiality and Integrity, Ensuring Proper Access Control, SaaS and PaaS Host Security, IaaS Host Security, Virtualization Software Security, Threats to the hypervisor, Virtual Server Security, Securing virtual servers.

UNIT-III	CLOUD APPLICATION	6

Application-Level Security Threats, DoS and EDoS, End User Security, End User Security, PaaS Application Security, Customer-Deployed Application Security, IaaS Application Security, Public Cloud Security Limitations.

UNIT-IV	CLOUD PRIVACY	6

Privacy: Data Life Cycle, Key Privacy Concerns in the Cloud, Protecting Privacy.

UNIT-V	CLOUD PRIVACY RISK MANAGEMENT	6

Privacy Risk Management:Collection Limitation Principle, Use Limitation Principle, Security Principle, Transfer Principle, Accountability Principle, Legal and Regulatory Implications.

Contact Hours : 30

List of Experiments	
1.	**Private Cloud**
a	Setup a Private Cloud by performing the procedure using a Single node OPENSTACK implementation.
b	Perform Creation, Management and Termination of a CirrOS instance in OPENSTACK.
c	Show the virtual machine migration based on certain conditions from one node to the other.
2	**Public Cloud**
a	Develop a simple application to understand the concept of PAAS using GAE/Amazon Elastic Beanstalk/IBM Blue Mix/GCC and launch it.
b	Test how a SaaS applications scales in response to demand.
c	Find the procedure to launch a Cloud instance using a Public IaaS cloud like AWS/GCP.
3	**Data Encryption**
a	Encrypt data both in transit and at rest using robust encryption algorithms.
b	Implement Transport Layer Security (TLS) for securing communication channels.
c	Use disk encryption to protect data stored on physical or virtual disks.

4	**Access Control Policies**			
a	Develop access control policies defining who can access what resources.			
b	Implement role-based access control (RBAC) to assign permissions based on roles.			
5	**Identity Access Management**			
a	Capture all the flags in AWS bigiam challenges that consists of common misconfigurations in IAM.			
		Contact Hours	**:**	**30**
		Total Contact Hours	**:**	**60**

Course Outcomes: On completion of the course, the students will be able to	
•	Understand the cloud concepts and fundamentals.
•	Explain the infrastructure security in cloud
•	Define cloud application.
•	Understand various privacy in the cloud.
•	Define the various privacy risk management.
Text Book(s):	
1	Tim Mather, Subra Kumaraswamy, and Shahed Latif" Cloud Security and Privacy", O'Reilly, First Edition 2009.
2	Eyal Estrin, "Cloud Security Handbook", Packt, 2022.
Reference Book(s) / Web link(s):	
1	Michael J. Kavis "Architecting the Cloud: Design Decisions for Cloud Computing Service Models(SaaS, PaaS, and IaaS)", First Edition, Wiley,2014.
2	Tom White, "Hadoop: The Definitive Guid". Yahoo Press, 2014.
3	Rajkumar Buyya, Christain Vecchiola, and Thamarai Selvi, "Mastering Cloud Computing", Tata McGraw Hill, 2013.
4	John W. Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010.
5	Thomas Erl, Zaigham Mahood, Ricardo Puttini- "Cloud Computing, Concept, Technology and Architecturel", Prentice Hall, First Edition, 2013.
6	Kai Hwang, Geoffery C, Fox and Jack J, Dongarra," Distributed and Cloud Computing: Clusters, Grids, Clouds and the Future of Internet", First Edition, Morgan Kaufman Publisher, an Inprint of Elsevier, 2012.
7	https://www.itu.int/dms_pub/itu-t/oth/23/01/T23010000160001PDFE.pdf
8	https://www.youtube.com/watch?v=dmEe6dHBKYc
9	https://www.youtube.com/watch?v=zd4LWt5Phac
10	https://www.youtube.com/watch?v=qTRmgP3oaqk

CO-PO-PSO Matrices of course

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CR23A34.1	3	2	1	-	2	-	-	-	-	1	-	2	2	1	-
CR23A34.2	2	3	2	2	3	1	-	2	-	-	1	2	3	2	-
CR23A34.3	2	2	3	-	3	-	-	1	1	-	-	1	2	2	-
CR23A34.4	2	2	1	-	2	2	1	3	-	1	-	1	2	1	1
CR23A34.5	2	3	2	1	2	2	1	3	-	1	2	1	2	1	2
Average	2.2	2.4	1.8	1.5	2.4	1.6	1	2.25	1	1	1.5	1.4	2.2	1.4	1.5

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (low) 2: Moderate (Medium) 3: Substantial (High) No correlation:"-"

Subject Code	Subject Name (Lab Oriented Theory course)	Category	L	T	P	C
CR23A35	SOCIAL NETWORK SECURITY	PE	2	0	2	3

Objectives:	
•	To understand and develop semantic web related applications
•	To understand privacy and security issues in Social Networking
•	To learn about the data extraction and mining of social networks
•	To discuss the prediction of human behaviour in social communities
•	To learn about the Access Control and identity management

UNIT I	FUNDAMENTALS OF SOCIAL NETWORKING	6
Introduction to Semantic Web, Limitations of current Web, Development of Semantic Web, Emergence of the Social Web, Social Network analysis, Development of Social Network Analysis, Key concepts and measures in network analysis, Historical overview of privacy and security, Major paradigms, for understanding privacy and security.		
UNIT II	**PRIVACY AND SECURITY ISSUES**	**6**
The evolution of privacy and security concerns with networked technologies, Contextual influences on privacy attitudes and behaviours, Anonymity in a networked world.		
UNIT-III	**EXTRACTION AND MINING IN SOCIAL NETWORKING DATA**	**6**
Extracting evolution of Web Community from a Series of Web Archive, detecting communities in social networks, Definition of community, evaluating communities, Methods for community detection and mining, Applications of community mining algorithms, Tools for detecting communities social network infrastructures and communities, Big data and Privacy.		
UNIT IV	**PREDICTING HUMAN BEHAVIOUR AND PRIVACY ISSUES**	**6**
Understanding and predicting human behaviour for social communities, User data Management, Inference and Distribution, Enabling new human experiences, Reality mining, Context, Awareness, Privacy in online social networks, Trust in online environment, What is Neo4j, Nodes, Relationships, Properties.		
UNIT-V	**ACCESS CONTROL AND IDENTITY MANAGEMENT**	**6**
Understand the access control requirements for Social Network, Enforcing Access Control Strategies, Authentication and Authorization, Roles-based Access Control, Host, storage and network access control options, Firewalls, Authentication, and Authorization in Social Network, Identity & Access Management, Single Sign-on, Identity Federation, Identity providers and service consumers, The role of Identity provisioning.		
Total Contact Hours : 30		

List of Experiments	
1	Developing a social media application.
2	Create a Network model using Neo4j.
3	Read and write Data from Graph Database.
4	Find “Friend of Friends” using Neo4j.
5	Implement secure search in social media.
6	Create a simple Security & Privacy detector.
Contact Hours :	**30**
Total Contact Hours :	**60**

Course Outcomes:	
On completion of course you will be able to	
•	Develop a semantic web related application
•	Address Privacy and Security issues in Social Networking
•	Extract and mine the social networks data
•	To predict human behaviour in social communities
•	To enforce access control mechanism and do identity management

Suggested Activities:	
•	Assignment problems.
•	Class presentation/Discussion

Textbooks:	
1.	Peter Mika, “Social Networks and the Semantic Web”, First Edition, Springer 2007.
2.	BorkoFurht, “Handbook of Social Network Technologies and Application”, First Edition, Springer, 2010.
3.	Jerome Baton and Rik Van Bruggen, "Learning Neo4j 3.x", Second Edition, Packt publishing, 2017
4.	David Easley, Jon Kleinberg, "Networks, Crowds, and Markets: Reasoning about a Highly Connected World", First Edition, Cambridge University Press, 2010.

Reference Books (s)/Web links:
Easley D and Kleinberg J., “Networks, Crowds, and Markets – Reasoning about a Highly Connected World”, Cambridge University Press, 2010.
Jackson and Matthew O, “Social and Economic Networks”, Princeton University Press, 2008.
GuandongXu ,Yanchun Zhang and Lin Li, “Web Mining and Social Networking – Techniques and applications”, First Edition, Springer, 2011.
Dion Goh and Schubert Foo, “Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively”, IGI Global Snippet, 2008
Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, “Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modeling”, IGI Global Snippet, 2009.
John G. Breslin, Alexander Passant and Stefan Decker, “The Social Semantic Web”, Springer, 2009.

Subject Code	Subject Name (Lab Oriented Theory course)	Category	L	T	P	C
CS23A35	Web Application Security	PE	2	0	2	3

Objectives:
● To understand the fundamentals of Web Application Security
● To know about web application authentication and authorization mechanism
● To identify common web application vulnerabilities
● To focus on wide aspects of secure development and deployment of web applications
● To get insight about mitigations and countermeasures against web application attacks

UNIT I	INTRODUCTION	6
History of Software Security – OWASP Top Ten List 2021 – Input Validation – Attack Surface Reduction – Classifying and Prioritizing Threats		
UNIT II	**WEB APPLICATION SECURITY PRINCIPLES**	**6**
Authentication - Access Control Overview - Two Factor and Three Factor Authentication - Web Application Authentication – Authorization - Session Management Fundamentals - Securing Web Application Session Management		
UNIT-III	**COMMON WEB APPLICATION VULNERABILITIES**	**6**
Cross Site Scripting- Reflected XSS- Stored XSS- DOM based XSS- Mutation based XSS – Cross Site Request Forgery - SQL Injection – Code Injection – Insecure Direct Object References (IDOR)		
UNIT IV	**SECURE DEVELOPMENT AND DEPLOYMENT**	**6**
Application Security- Training- Threat Modelling- Secure Coding Libraries- Code Review- Security Testing- Security Incident Response Planning – Microsoft Security Development Lifecycle (SDL) – OWASP Comprehensive Lightweight Application Security Process (CLASP) – Software Assurance Maturity Model (SAMM)		
UNIT-V	**MITIGATIONS AND COUNTERMEASURES**	**6**
Anti XSS Coding Best Practices- Sanitizing User Input – Anti CSRF Coding Best Practices – Mitigating Against SQL Injection – Generic Injection Defenses – Defending Against IDOR – Architecture Level Mitigations		
Total Contact Hours : 30		

List of Experiments	
1	Identify security issues in web application – Walking An Application in TryHackMe Platform
2	Burp Suite Basics in TryHackMe Platform
3	OWASP ZAP to scan authenticated web application in TryHackMe Platform
4	SQL Injection Lab in TryHackMe Platform
5	Explore OWASP Top Ten -2021 Vulnerabilities in TryHackMe Platform
6	SQLmap to exploit web application in TryHackMe Platform
7	Exploit File Inclusion and Path Traversal Vulnerabilities in TryHackMe Platform
8	Server Side Template Injection in TryHackMe Platform
9	DejaVu Code Injection Vulnerability in TryHackMe Platform
10	NoSQL Injection on MongoDB in TryHackMe Platform
Contact Hours :	**30**
Total Contact Hours :	**60**

Course Outcomes: On completion of course you will be able to
● Understand the fundamentals of web application security
● Apply security principles in developing a secure web application
● Identify common web vulnerabilities that are exploited by hackers
● Identify the secure model for web application development and deployment
● Apply best practices for mitigations of vulnerabilities

Suggested Activities:

- Assignment problems, Quiz.
- Class presentation/Discussion

Textbooks:	
1.	Andrew Hoffman, “Web Application Security: Exploitations and Countermeasures for Modern Web Applications”, 2nd Edition, O’Reilly, 2024
2.	Brian Sullivan and Vincent Liu, “Web Application Security: A Beginners Guide”, 1st Edition, McGrawHill, 2012

Reference Books (s)/Web links:	
1.	Ron Lepofsky, "The Manager's Guide to Web Application Security: A Concise Guide to the Weaker Side of the Web", Apress, 2015
2.	Dafydd Stuttard and Marcus Pinto, "The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws", 2nd Edition, Wiley, 2011
3.	Joseph Marshall, "Hands-On Bug Hunting for Penetration Testers: A practical guide to help ethical hackers discover web application security flaws", Packt, 2018
4.	https://owasp.org/www-project-top-ten/
5.	https://tryhackme.com/r/hacktivities/search
6.	https://portswigger.net/web-security/learning-paths

CO - PO – PSO matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CS23A35.1	1	2	2	1	3	-	-	-	-	-	-	1	-	-	-
CS23A35.2	2	1	2	1	3	-	-	-	-	-	-	-	-	-	-
CS23A35.3	1	1	1	2	3	-	-	-	-	-	-	1	-	-	-
CS23A35.4	1	2	1	1	2	-	-	-	-	-	-	-	-	-	-
CS23A35.5	1	2	2	2	2	-	-	-	-	-	-	1	-	-	-
Average	1.2	1.6	1.6	1.4	2.6	-	-	-	-	-	-	1	-	-	-

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3:Substantial (High) No

Subject Code	Subject Name (Lab Oriented Theory Course)	Category	L	T	P	C
CR23A36	INFORMATION SECURITY AND MANAGEMENT	PE	2	0	2	3

Objectives:

- To understand the basics of Information Security and legal and ethical issues in Information Security.
- To understand the information security policy and concepts of access control.
- To learn about auditing techniques and tools.
- To learn about intrusion detection and prevention techniques and tools.
- To Learn to analyze and validate forensics data

UNIT-I	**INTRODUCTION**	**6**

Security Trends, OSI security architecture, Security attacks, security services, security mechanisms, Security System Development Life cycle – Legal, Ethical and Professional issues.

UNIT-II	**SECURITY ANALYSIS**	**6**

Risk Management - Identifying and Assessing Risk - Assessing and Controlling Risk. Blueprint for Information Security - Information Security Policy. Case Study: Healthcare Data Security

UNIT-III	**SECURITY TECHNOLOGY**	**6**

Intrusion Detection and Prevention Systems (IDPS)-Terminology-Types-Detection methods. Honeypots, Honeynets and padded cell systems. Scanning and Analysis Tools-Port scanners-Firewall analysis tools, Operating system detection tools- Vulnerability scanners-Packet sniffers-Wireless security Tools

UNIT-IV	**AUDITING**	**6**

Overview, Access control, IT Audit, Authentication. Open Web Application Security Project (OWASP), Web Site Audit and Vulnerabilities assessment- Case Study: Web Application Security Assessment for Online Retailer

UNIT-V	**ANALYSIS AND VALIDATION**	**6**

Validating Forensics Data – Data Hiding Techniques – Performing Remote Acquisition – Network Forensics – Email Investigations – Cell Phone and Mobile Devices Forensics. -Case Study: WannaCry Ransomware Attack

Contact Hours	**:**	**30**

List of Experiments

Implementation to gather information from any PC‟s connected to the LAN using whois, port scanners, network scanning, Angry IP scanners etc.

Implementation of Steganography

Implementation of Mobile Audit and generate the report of the existing Artifacts.

Implementation of IT Audit, malware analysis and Vulnerability assessment and generate the report.

Implementation of Cyber Forensics tools for Disk Imaging, Data acquisition, Data extraction and Data Analysis and recovery.

Perform mobile analysis in the form of retrieving call logs, SMS log ,all contacts list using the forensics tool like SAFT

Implementation to identify web vulnerabilities, using OWASP project.

Contact Hours : 30

Total Contact Hours : 60

Subject Code	Subject Name(LabOrientedTheoryCourse)	Category	L	T	P	C
CD23O31	3D MAYA	PC	2	0	2	3

Objectives:	
•	To understand the Maya interface by navigating viewports, using the toolbar and menu bar, and managing channel attributes.
•	To master modelling techniques by creating and editing models using primitive objects, NURBS, and polygon tools.
•	To explore texturing by applying materials and using the UV Texture Editor for colors and textures.
•	To develop lighting and rendering skills by applying basic lighting concepts and understanding rendering techniques.
•	To animate and rig characters by studying animation principles, using the Graph Editor, and understanding rigging and constraints.

UNIT-I	INTRODUCTION TO MAYA INTERFACE	6
Introduction to MAYA Interface - Software and Hardware Requirement-Understanding about View Ports- Tool bar & Menu bar- Layers, Shortcut Keys, Understanding Primitive objects - Channel Box & Hot Box -Channel Attributes & Outline Editor		
UNIT-II	**MODELING**	6
Introduction to modelling with Primitive objects NURBS & polygon tools -Organic and Industrial designs -Editing Nurbs & Polygons -Learning Menus in Surfaces and Polygons Tabs & Shortcut. -2Texturing -Introduction to Materials & Understanding Materials & Behaviour-Understanding UV Texture Editor & Applying Single Color to object.		
UNIT-III	**LIGHTING AND RENDERING**	6
Understanding Color Theory & Introduction to lighting -Importance of light in Animation - Basic Lighting Concepts types of lights-Change the colour of the light, light attributes, rendering-Introduction to rendering & Knowing Renderers -Software Rendering & Hardware Rendering.		
UNIT-IV	**ANIMATION AND RIGGING**	6
Introduction to Animation in MAYA & Time Codes - Principles of animation - Doing Object animation & Understanding the Behaviour of Shapes of Objects- Making play blasts Working with Animation Curves Graph Editor - Time Line Shortcuts, Camera Animation & Setting Resolution Gates. **Rigging** - Knowing Deformers and there functionality -Knowing Constraints		
UNIT-V	**DYNAMICS**	6
Understanding Classical Animation, Doing Cell Animation, Understanding the Light Board Designing the Layout, Preparing the Rough Sketch for Animation, Drawing Key Poses for Animation, Shade and Color Filling. Doing Animation Human Walk, Doing Animation Animal Walk.		
	Total Contact Hours : 30	

List of Experiments	Total Contact Hours:30
1	Create a simple sprite animation using an open source tool.
2	Consider your favourite game and identify the game elements.
3	Narrate a simple game using scratch 2.0 (Character narration).
4	Study of Unity.
5	Develop a simple 2D game using Unity.
6	Develop a simple 3D game using Unity
	Miniproject: Create a simple 3D room with basic furniture and objects.

Course Outcomes: On completion of the course, the students will be able to	
CO1	Navigate the Maya interface, utilize tools like the Channel Box, Hot Box, and Outline Editor, and manipulate primitive objects effectively.
CO2	Apply NURBS and polygon tools to create organic and industrial models, edit surfaces, and utilize UV Texture Editor for basic texturing.
CO3	Implement lighting techniques, adjust light attributes, and perform both software and hardware rendering in Maya.
CO4	Animate objects using principles of animation, edit animation curves, and apply rigging techniques with deformers and constraints.
CO5	Create classical animations, design layouts, and execute key poses for human and animal walk cycles with shading and coloring techniques.

Text Book(s):	
1	Kelly L. Murdock, **"Autodesk Maya 2024 Basics Guide**", SDC Publications, 1st Edition, July 2023.

Reference Book(s):	
1	Kelly L. Murdock, **"Autodesk Maya 2024 Basics Guide",** SDC Publications, 1st Edition, 2024.
2	Prof. Sham Tickoo, **"Autodesk Maya 2024: A Comprehensive Guide**", CADCIM Technologies, 15th Edition, 2023.

CO - PO – PSO matrices of course

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CD23O31.1	1	3	3	3	3	2	3	2	3	3	3	2	3	1	3
CD23O31.2	1	3	3	3	3	2	3	2	3	3	3	2	3	1	3
CD23O31.3	1	3	3	3	3	2	3	2	3	3	3	2	3	1	3
CD23O31.4	1	3	3	3	3	2	3	2	3	3	3	2	3	1	3
CD23O31.5	1	3	3	3	3	2	3	2	3	3	3	2	3	1	3
Average Mapping	1	**3**	**3**	**3**	**3**	2	**3**	2	**3**	**3**	**3**	2	**3**	1	**3**

Correlation levels 1, 2 or 3 are as defined below:
1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation: "-"

Sub. Code	Subject Name	Category	L	T	P	C
CD23O32	UI & UX DESIGN	PC	2	0	2	3

Objectives:	
●	To learn the fundamentals of User Interface Design.
●	To learn the fundamentals of User Design Elements.
●	To study the principles of heuristic evaluation for interactive design.
●	To familiarize the facets of User Experience (UX) Design, particularly as applied to the digital artefacts.

UNIT-I	THE USER INTERFACE— INTRODUCTION AND OVERVIEW	6
Basics of User Interface-Importance of User Interface-Principles of UI-User Interface Design Process-Understand the Principles of Good Design: What screen user wants, what screens users do, Interface Design Goals.		
UNIT-II	**THE USER INTERFACE DESIGN ELEMENTS**	**6**
Introduction to Menus: Structure of Menus, Functions of Menus, Contents of Menus, Formatting of Menus, Selecting and Navigating Menus, Kinds of Graphical Menus-Windows: Window Characteristics, Types of windows, window Management, Organizing Window Functions-Device and Selection-Based Controls.		
UNIT-III	**EVALUATION OF INTERACTIVE DESIGN**	**6**
Introduction to Interactive Design process – Interactive design in practice – Introducing evaluation – Evaluation: Inspection, Methods, Usability in Design, Analysis and Models		
UNIT-IV	**INTRODUCTION TO USER EXPERIENCE**	**6**
Basics of UX design Process-Elements of UX-Design Thinking Techniques: Scenarios, Brainstorming, Design Tools- Techniques for Contextual Enquiry, User Interviews, Competitive Analysis for UX, Wire-Framing and Prototyping Techniques		
UNIT-V	**UX RESEARCH TECHNIQUES**	**6**
Research planning: Goals of Research, The Format of the Plan-Competitive Research: Methods, Focus Groups, Card Sorting, Usability testing, Iterative Product Development, Concept Development		
	Total Contact Hours :	**30**

List of the Experiments	Total Contact Hours : 30
1.	Develop and design a mobile or web application to change background color and menus.
2.	Redesign canteen menu to increase the ease of use and ease of functionality (Grid and Menu Views)
3.	Heuristic Evaluation: Group Assignment initiation (Website and App) Evaluation for key tasks of the app or website for heuristic principles, severity, recommendations.
4.	Students will identify a project in the given domain (Healthcare, E-Commerce, Online Learning Platforms, Gaming, Booking, Music) and its related website or mobile app to redesign. They will take this redesign project through the design lifecycle: Discovery Define Design Implement (Design Prototype) Usability Testing The below design methods and techniques will be imparted w.r.t. the group project selected by the students.
5.	Persona Creation for the group project
6.	Task flow detailing for the project.
7.	Project Prototyping Iteration 1 and 2.
8.	Pick your favourite design agency. Redesign their contact page in a more user-friendly way.
	Mini project: Design a user-friendly mobile app for managing tasks or to-do lists.

Course Outcomes: On completion of the course, the students will be able to	
CO1	Understanding of Design Thinking: Apply design thinking methodologies to address user-centric challenges in UI/UX design.
CO2	User Research & Insights: Gain skills to conduct user research, analyse feedback, and convert insights into design requirements.
CO3	Prototyping & Wire framing: Develop proficiency in creating wireframes, prototypes, and visual mock-ups for user interfaces.
CO4	Problem Solving: Use iterative design techniques to improve user experience and resolve usability issues.
CO5	Testing & Evaluation: Learn to conduct usability testing, gather user feedback, and make design improvements based on real-world data.

Text Book(s):	
1	Nigel Cross, **"Design Thinking: Understanding How Designers Think and Work",** Berg, 1st Edition, 2024.
2	William Lidwell, Kritina Holden, and Jill Butler, "**Universal Principles of Design",** Rockport Publishers, 6th Edition, 2024.
3	Laura Klein, **"Build Better Products: A Modern Approach to Building Successful User-Cantered Products",** O'Reilly Media, 1st Edition, 2024.

Reference Book(s):	
1	Uijun Park, "Introduction to Design Thinking for UX Beginners", Independently Published, 1st Edition, 2023.
2	Jeff Gothelf and Josh Seiden, "**Lean UX: Designing Great Products with Agile Teams"**, O'Reilly Media, 2nd Edition, 2024.

CO - PO – PSO matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CD23O32.1	2	2	2	1	1	-	-	-	3	2	2	2	2	2	2
CD23O32.2	2	3	2	1	1	-	-	-	3	2	3	2	2	2	2
CD23O32.3	2	3	2	2	2	-	-	-	-	-	-	2	2	3	2
CD23O32.4	2	-	-	2	3	-	-	-	-	-	-	-	2	2	-
CD23O32.5	2	2	-	3	3	-	1	2	3	2	1	3	2	3	-
Average Mapping	2	2.5	2	1.8	2	-	1	2	3	2	2	2.2 5	2	2.4	2

Correlation levels 1, 2 or 3 are as defined below:
1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation: "-"

Subject Code	Subject Name	Category	L	T	P	C
CD23A31	INTRODUCTION TO MOTION GRAPHICS	PE	2	0	2	3

Objectives:	
•	To understand the history, evolution, and significance of motion graphics and visual effects in modern media.
•	To learn and apply the basic principles of animation, including squash and stretch, anticipation, and staging.
•	To explore colour theory, typography, and layout principles for effective motion graphics design.
•	To create simple animations using basic tools and techniques.
•	To practice storyboarding techniques for visualization and project planning.

UNIT – I	INTRODUCTION	6
History, evolution, and key applications of motion graphics – visual Effects - Definition, scope, and importance in modern media		
UNIT – II	**PRINCIPLES OF ANIMATION**	**6**
Animation principles- Squash and stretch, anticipation, staging - Timing and Spacing - Understanding rhythm, flow, and fluidity in animation		
UNIT –III	**DESIGN AND COMPOSITION**	**6**
Color theory, typography, and layout principles - Storyboarding techniques, visualization, and planning.		
UNIT –IV	**PRACTICAL MOTION GRAPHICS CREATION**	**6**
Basic tools and features of Adobe After Effects and Blender - Creating a simple animation using learned tools and techniques		
UNIT – V	**ADVANCED TECHNIQUES AND TRENDS**	**6**
Using expressions, 3D layers, and plugins - Contemporary styles, techniques, and future directions -		
	Total Contact Hours : 30	

List of Experiments	Total Contact Hours : 60
1	Create a timeline highlighting key milestones and breakthroughs in motion graphics.
2	Create a short animation focusing on rhythmic movement and fluid transitions.
3	Create a motion graphic sequence using complementary and analogous colour schemes.
4	Create simple animations demonstrating each principle using Adobe After Effects or Blender.
5	Design and animate a short project, such as a moving logo or simple character animation.
6	Create a storyboard for a simple animation, including key frames and notes on movement.
7	Create animations using basic expressions like wiggle or time-based effects in After Effects.
	Mini project: Create an engaging animated text sequence for a fictional movie or brand

Course Outcomes: On completion of the course, the students will be able to	
CO1	Understand the history, evolution, and applications of motion graphics and visual effects in modern media.
CO2	Apply core animation principles like squash and stretch, anticipation, timing, and spacing to achieve rhythm and fluidity in motion graphics.
CO3	Utilize colour theory, typography, layout principles, and storyboarding techniques to plan and design motion graphics projects.
CO4	Demonstrate proficiency with tools like Adobe After Effects and Blender to create basic motion graphics and animations.
CO5	Explore advanced features such as expressions, 3D layers, and plugins while analyzing contemporary styles and future trends in motion graphics.

Text Book(s):	
1	Chris and Trish Meyer, "Creating Motion Graphics with After Effects", Wiley, 3rd Edition, 2021.
2	Chris Jackson, "Motion Design Toolkit", Cengage Learning, 1st Edition, 2021.
3	William J. McCauley, "Introduction to Motion Graphics", Routledge, 1st Edition, 2022.
Reference Book(s) /Web links:	
1.	https://www.youtube.com/watch?v=RmH4gKSBJ5Y
2.	https://www.youtube.com/watch?v=ROw_Xnmg2W4
3,	https://www.youtube.com/watch?v=5tQ0hf2SCeo

CO - PO – PSO matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CD23C31.1	-	1	2	2	2	3	1	1	1	2	1	3	0	0	3
CD23C31.2	0	1	2	2	2	3	1	1	1	2	1	3	0	0	3
CD23C31.3	0	1	2	2	2	3	1	3	1	2	1	3	0	0	3
CD23C31.4	0	1	2	2	2	3	1	1	1	2	1	3	0	0	3
CD23C31.5	0	1	2	2	3	3	1	1	1	2	1	3	0	0	3
Average Mapping	0	1	2	2	2.2	3	1	1.4	1	2	1	3	0	0	3

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation:

Subject Code	Subject Name Lab Oriented Theory Course	Category	L	T	P	C
CD23A32	FUNDAMENTALS OF AUGMENTED REALITY	PE	2	0	2	3

UNIT-I	INTRODUCTION TO AUGMENTED REALITY (AR)	6
What Is Augmented Reality - Defining augmented reality, history of augmented reality, The Relationship Between Augmented Reality and Other Technologies-Media, Technologies, Other Ideas Related to the Spectrum Between Real and Virtual Worlds		
UNIT-II	**AUGMENTED REALITY HARDWARE**	**6**
Augmented Reality Hardware – Displays – Audio Displays, Haptic Displays, Visual Displays, Other sensory displays, Visual Perception, Requirements and Characteristics, Spatial Display Model. Processors – Role of Processors, Processor System Architecture, Processor Specifications.		
UNIT-III	**COMPUTER VISION FOR AUGMENTED REALITY & AR SOFTWARE**	**6**
Computer Vision for Augmented Reality - Marker Tracking, Multiple-Camera Infrared Tracking, Natural Feature Tracking by Detection, Simultaneous Localization and Mapping, Outdoor Tracking. Augmented Reality Software - Introduction, Major Software Components for Augmented Reality Systems, Software used to Create Content for the Augmented Reality Application.		
UNIT-IV	**MARKER-BASED APPROACH IN AUGMENTED REALITY**	6
Marker-based approach- Introduction to marker-based tracking, types of markers, marker camera pose and identification, visual tracking, mathematical representation of matrix multiplication Marker types- Template markers, 2D barcode markers, imperceptible markers.		
UNIT-V	**DEVELOPING 3D GAME USING UNITY**	**6**
AR Components – Scene Generator, Tracking system, monitoring system, display, Game scene **AR Devices** – Optical See- Through HMD, Virtual retinal systems, Monitor bases systems, Projection displays, Video see-through systems		
	Total Contact Hours : 30	

List of Experiments	Total Contact Hours : 60
1	Create a marker-based AR application. Design or use a pre-defined marker.
2	Develop an AR app that places virtual objects in real-world environments. Implement plane detection using ARCore/ARKit.
3	Build an AR app for indoor or outdoor navigation. Use location-based AR techniques.
4	Create an app that recognizes and augments specific real-world objects. Train the app to recognize an object using AR libraries.
5	Develop a simple AR-based game. Use AR tools to create a virtual game environment.
6	Implement gesture-based interactions in an AR environment. Integrate a library for hand tracking or gesture detection.
	Mini project: AR-Based Home Interior Designer - Build an AR app that allows users to place and visualize furniture in their real-world spaces.

Course Outcomes: On completion of the course, the students will be able to	
CO1	Describe how AR systems work and list the applications of AR.
CO2	Understand and analyse the hardware requirement of AR.
CO3	Use computer vision concepts for AR and describe AR techniques
CO4	Analyse and understand the working of various state of the art AR devices
CO5	Acquire knowledge of mixed reality

Textbooks	
1	Dieter Schmalstieg,"Tobias Hollerer- Augmented Reality", Usability Press,1st Edition 2024.
2	Paul Mealy, "Virtual & Augmented Reality For Dummies", Wiley, 1st Edition,2024.
3	Tony Mullen, "Prototyping Augmented Reality", O'ReillyMedia ,1st Edition 2024.

Reference Book(s)/ Web links :	
1.	Dieter Schmalstieg, "Augmented Reality", Usability Press, 1st Edition ,2024.
2.	Steve Aukstakalnis,"A Guide to the Technologies, Applications, and Human Factors for AR and VR", Pearson, 1st Edition,2024.
3	https://www.augmentedreality.org/
4	https://arpost.co/
5	https://ieeexplore.ieee.org/Xplore/home.jsp

CO – PO – PSO matrices of course

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CD23A32.1	2	2	2	1	1	-	-	-	3	2	2	2	2	2	2
CD23A32.2	2	3	2	1	1	-	-	-	3	2	3	2	2	2	2
CD23A32.3	2	3	2	2	2	-	-	-	-	-	-	2	2	3	2
CD23A32.4	2	-	-	2	3	-	-	-	-	-	-	-	2	2	-
CD23A32.5	2	2	-	3	3	-	1	2	3	2	1	3	2	3	-
Average	2	2.5	2	1.8	2	-	1	2	3	2	2	2.25	2	2.4	2

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation: "-"

Subject Code	Subject Name Lab Oriented Theory Course	Category	L	T	P	C
CD23A33	FUNDAMENTALS OF VIRTUAL REALITY	PE	2	0	2	3

Objectives:

- To understand the basic concepts of Virtual Reality.
- To learn VR hardware and software.
- To understand VR development techniques.
- To learn about user interaction in VR.
- To examine the applications and impact of VR.

UNIT-I	INTRODUCTION TO VIRTUAL REALITY	6

Defining Virtual Reality, History of VR, Human Physiology and Perception, Key Elements of Virtual Reality Experience, Virtual Reality System, Interface to the Virtual World-Input & output- Visual, Aural & Haptic Displays, Applications of Virtual Reality.

UNIT-II	REPRESENTING THE VIRTUAL WORLD	6

Representation of the Virtual World, Visual Representation in VR, Aural Representation in VR and Haptic Representation in VR

UNIT-III	THE GEOMETRY OF VIRTUAL WORLDS &THE PHYSIOLOGY OF HUMAN VISION	6

Geometric Models, Changing Position and Orientation, Axis-Angle Representations of Rotation, Viewing Transformations, Chaining the Transformations, Human Eye, eye movements & implications for VR.

UNIT-IV	VISUAL PERCEPTION AND RENDERING	6

Visual Perception - Perception of Depth, Perception of Motion, Perception of Colour, Combining Sources of Information Visual Rendering -Ray Tracing and Shading Models, Rasterization, Correcting Optical Distortions, Improving Latency and Frame Rates

UNIT-V	MOTION AND TRACKING	6

Motion in Real and Virtual Worlds- Velocities and Accelerations, The Vestibular System, Physics in the Virtual World, Mismatched Motion and Vacation Tracking- Tracking 2D & 3D Orientation, Tracking Position and Orientation, Tracking Attached Bodies

Total Contact Hours : 30

List of Experiments **Total Contact Hours : 60**

1	Create a basic 3D virtual environment (e.g., a room or outdoor scene).
2	Add spatial audio to a VR scene to create an immersive experience.
3	Design a simple VR game (e.g., a shooting or puzzle game).
4	Create an educational VR experience (e.g., virtual field trip, anatomy lesson).
5	Design a VR experience with accessibility features for users with disabilities.
	Mini project: Design a simple VR game where users can pick up, move, and interact with objects within a virtual space.

Course Outcomes: On completion of the course, the students will be able to	
CO1	Describe how VR systems work and list the applications of VR.
CO2	Understand the design and implementation of the hardware that enables VR systems to be built.
CO3	Understand the system of human vision and its implication on perception and rendering.
CO4	Explain the concepts of motion and tracking in VR systems.
CO5	Describe the importance of interaction and audio in VR systems.

Textbooks	
1	Steven M. LaValle,"Virtual Reality", Cambridge University Press, 1st Edition ,2023.
2	Jaymes D. Dorsey, "Understanding Augmented Reality: Concepts and Applications", Academic Press,1st Edition,2023.
3	Robert F. Williams, "Fundamentals of Virtual Reality", Springer, 1st Edition,2021.

Reference Book(s) / Web links :	
1.	Gerard Jounghyun Kim, "Designing Virtual Systems: The Structured Approach", 3rd Edition,2022.
2.	Ernest Kuijff, Joseph J. LaViola Jr., Ivan Poupyrev, Doug A. Bowman, "3D User Interfaces, Theory and Practice", Addison Wesley, 4th Edition, (2023)
3	https://www.coursera.org/learn/introduction-virtual-reality

CO – PO – PSO matrices of course

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CD23A33.1	2	2	2	1	1	-	-	-	3	2	2	2	2	2	2
CD23A33.2	2	3	2	1	1	-	-	-	3	2	3	2	2	2	2
CD23A33.3	2	3	2	2	2	-	-	-	-	-	-	2	2	3	2
CD23A33.4	2	-	-	2	3	-	-	-	-	-	-	-	2	2	-
CD23A33.5	2	2	-	3	3	-	1	2	3	2	1	3	2	3	-
Average	2	2.5	2	1.8	2	-	1	2	3	2	2	2.25	2	2.4	2

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation: "-"

Subject Code	Subject Name Lab Oriented Theory Course	Category	L	T	P	C
CD23A35	DIGITAL VIDEO PRODUCTION	PE	2	0	4	4

Objectives:	
•	To provide a foundation to the fast growing field of AR and make the students aware of the various AR devices.
•	To learn to cut, trim, arrange footage, and enhance videos with transitions, sound effects, colour correction, and text overlays.
•	To learn shot composition, framing, camera angles, lighting, and movement to effectively tell a story.
•	To gain knowledge in audio recording, mixing, and post-production techniques.
•	To learn the basics of VFX and motion graphics to add dynamic elements like animated logos and text.

UNIT – I	INTRODUCTION OF VIDEO PRODUCTION	6
Types of Productions, Production Path - Convergence and the Digital Age - Visual Aesthetics - Field of View - video formats and distribution channels -		
UNIT – II	**CAMERA TECHNIQUES**	**6**
Introduction to camera equipment - Principles of composition and framing - Camera control - Camera movements: pan - tilt - dolly - zoom		
UNIT –III	**LIGHTING AND AUDIO FOR VIDEO**	**6**
Three-point lighting - Working with natural light vs. artificial light - Lighting setups for interviews and dramatic scenes - Using external microphones (shotgun, lavalier) - Syncing audio and video		
UNIT –IV	**POST-PRODUCTION AND EDITING**	**6**
video editing software (e.g., Adobe Premiere, Final Cut Pro) - Editing basics: cutting, transitions, and audio sync - Adding special effects and colour grading		
UNIT – V	**LIVE AND STREAMING VIDEO PRODUCTION**	**6**
Setting up for live-streaming - Managing multi-camera setups for live broadcasts		
	Total Contact Hours : 30	

List of Experiments	Total Contact Hours : 60
1	Capture images with various fields of view (wide, medium, close-up).
2	Practice camera movements: pan, tilt, dolly, and zoom.
3	Record audio with different microphones and sync it with video.
4	Audio Synchronization Practice With: A camera, external microphone (shotgun or lavalier), and video editing software.
5	Simple Video Editing Exercise With: Video editing software (e.g., Adobe Premiere Pro, Final Cut Pro) and video footage.
6	Live Streaming Simulation With: A camera, live-streaming software (e.g., OBS Studio), and multi-camera setup.
	Mini project: Choose a short story, script, or music track and create a 2-3-minute short film or music video. Focus on mastering basic editing skills, including cutting, trimming, transitions, colour grading, and adding sound effects and music.

Course Outcomes: On completion of the course, the students will be able to	
CO1	Understand video production processes
CO2	Use Camera and technical proficiency
CO3	Develop storytelling skills
CO4	Apply Post-production skills:
CO5	Creating Collaborative production

Textbooks	
1	Tom Wolsky, "Digital Video Production: A Practical Guide", Routledge, 5th Edition, 2021.
2	Peter W. Rea and David K. Irving, "Producing and Directing the Short Film and Video", Routledge, 6th Edition, 2021.

Reference Book(s) / Web links :	
1.	Steven Ascher and Edward Pincu, "The Filmmaker's Handbook: A Comprehensive Guide for the Digital Age", Focal Press, 5th Edition, 2022.
2.	Thomas A. Ohanian and Michael E. Phillips, "Digital Filmmaking: The Changing Art and Craft of Making Motion Pictures", Focal Press, 1st Edition, 2012.
3	https://onlinecourses.swayam2.ac.in/ntr21_ed09/preview
4	https://onlinecourses.swayam2.ac.in/aic19_de01/preview

CO – PO – PSO matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CD23A35.1	2	2	2	1	1	-	-	-	3	2	2	2	2	2	2
CD23A35.2	2	3	2	1	1	-	-	-	3	2	3	2	2	2	2
CD23A35.3	2	3	2	2	2	-	-	-	-	-	-	2	2	3	2
CD23A35.4	2	-	-	2	3	-	-	-	-	-	-	-	2	2	-
CD23A35.5	2	2	-	3	3	-	1	2	3	2	1	3	2	3	-
Average	2	2.5	2	1.8	2	-	1	2	3	2	2	2.25	2	2.4	2

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation: "-"

Subject Code	Subject Name(Laboratory Course)	Category	L	T	P	C
CD23C32	DATA VISUALIZATION	PC	3	0	2	4

Objectives:	
●	To introduce students to Excel's basic and advanced data visualization techniques.
●	To familiarize students with Tableau.
●	To develop skills in using Power BI.
●	To enable students to design comprehensive visual dashboards.
●	To apply knowledge through a capstone project.

List of Experiments	
Excel for Data Visualization	
1	**Data Manipulation and Cleaning** • Using Functions and formulae for Data Cleaning. • Sorting, Filtering and Data Validation techniques.
2	**Excel Charts and Tools** • Getting started with charts (Bar, Line, Pie). • Advanced charts (Histograms, Box plots, Area Chart, Bubble chart).
3	**Excel Advanced Features** • Using PivotTables for data analysis. • Dynamic Dashboards with Slicers and Timeline.
Data Visualization with Tableau	
4	**Getting Started with Tableau** • Connecting to data and basic visualizations. • Interactive Dashboards and Storytelling. • Filters, Pages, Hierarchies, Sorting and Dates.
5	**Advanced Data Manipulation Techniques** • Calculated fields and parameters. • Calculations and Expressions -Total and Aggregations, Automatic and Custom split. • Organizing Data and Visual Analytics – Reference lines and bands, Clusters, Forecasting, Trend lines, Summary Card.
Data Visualization with Power BI	
6	**Introduction to Power BI** • Getting started with Data importing and transforming with Power Query. • Report designing with basic visualizations and using the visualization pane. • Measures, Filters. • Features of Power BI- Drill through, Hierarchies.
7	**Advanced Power BI** • DAX. • Creating complex reports and dashboards.

8	**Capstone Project -** Students will select a real-world dataset and use any tools (Excel, Tableau, and Power BI) to create comprehensive dashboards.		
	Total Contact Hours	**:90**	**90**

Course Outcomes:	
On completion of course you will be able to	
CO1	Create basic and advanced visualizations in Excel for data analysis.
CO2	Develop interactive dashboards and perform data manipulations in Tableau.
CO3	Design reports and apply DAX for advanced reporting in Power BI.
CO4	Integrate and organize data to create comprehensive dashboards using various visualization tools.
CO5	Apply their learning to solve real-world data visualization problems using Excel, Tableau, and Power BI.

Textbooks:	
1	Kieran Healy, "Data Visualization: A Practical Introduction", Princeton University Press, 1st Edition, 2022.
2	Claus Wilke, "Fundamentals of Data Visualization: A Primer on Making Informative and Compelling Figures", O'Reilly Media, 2nd Edition, 2023.
3	Jon Schwabish, Better Data Visualizations: A Guide for Scholars, Researchers, and Wonks", Columbia University Press, 1st Edition, 2023.
4	Sanjeev J. Wagh, Manisha S. Bhende, Anuradha D. Thakare, "Fundamentals of Data Science", CRC Press, 2nd ,2022.
Reference Books (s):	
1.	Excel Visualizations Power BI Documentation
2.	https://learn.microsoft.com/en-us/training/browse/?products=power-bi https://www.tableau.com/learn/training
3.	Online Course: Coursera — Data Visualization with Tableau Excel Visualizations
4.	Power BI Documentation

CO - PO – PSO matrices of course

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CD23C32.1	3	2	2	1	2	-	-	-	-	-	-	-	3	2	1
CD23C32.2	3	3	2	2	3	1	-	-	-	-	-	-	3	3	2
CD23C32.3	3	2	3	2	3	-	1	-	-	-	-	-	3	3	2
CD23C32.4	3	3	3	2	3	-	1	1	-	-	-	-	3	3	3
CD23C32.5	3	3	3	3	3	2	2	1	1	1	2	1	3	3	3

correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation: "-"

Subject Code	Subject Name (Lab oriented Theory course)	Category	L	T	P	C
CS23B31	Introduction to METAVERSE	PE	2	0	2	3
For B.E Programme CSE and B.Tech Programme in IT						

Objectives:
• To learn the basics of Metaverse characteristics, concepts and layers.
• To understand and analyze Metaverse technologies, tools and platforms.
• To discuss design theories and practices relevant to the Metaverse.
• To explore cybersecurity and cybercrime in the Metaverse.
• To explore metaverse applications and examine open challenges in the Metaverse.

UNIT-I	Metaverse fundamentals	9
Metaverse evolution-Metaverse importance and characteristics-The interdisciplinary nature of the Metaverse- Metaverse opportunities and risks- Computer-mediated communication -Avatar-mediated communication-layers of Metaverse: Experience-Discovery-Creator economy- Spatial computing- Decentralization - Human interface- Infrastructure		
UNIT-II	**Metaverse technologies, tools and platforms**	**9**
Metaverse Technologies: AR/VR/MR/XR - 3D reconstruction - Game engines - Smart glasses-wearables, haptic devices, headsets and headwear -Blockchain, smart contracts, tokens, NFTs - Cryptography - Artificial Intelligence (AI) - Internet of Things (IoT) - Edge computing and 5G, 6G **Tools and technologies for Metaverse UX and UI:** Tools and services for avatar systems - Spatial user interface design - Cross-platform user experience design - Multimodal user interface-Technologies and devices for human computer interaction in Metaverse **Metaverse Platforms:** Decentraland, SANDBOX - Roblox, Axie Infinity- uHive, Hyper Nation - Nakamoto (NAKA), Metahero (HERO), Star Atlas (ATLAS)- Bloktopia (BLOK), Stageverse - Spatial, PalkaCity, Viverse -Sorare, Illuvium, Upland - Second Life, Sansar, Sensorium Galaxy		
UNIT-III	**Design theories and practices**	**9**
Social presence and co-presence - Motion sickness and cybersickness- Uncanny valley - Sense of self-location, sense of agency and sense of body ownership-Universal simulation principle- Prototyping-Evaluation techniques		
UNIT-IV	**Cybersecurity and Cybercrime in the Metaverse**	**9**
Metaverse and cybersecurity: Cybersecurity concerns in Metaverse: social engineering attacks, Data theft, Decentralization vs vulnerabilities - Cybersecurity risks in Metaverse: process, people, technology - Best practices for preventing cyberattacks in Metaverse: Risk assessment and mitigation, Physical security, Data encryption, Controlled access, Protect outbound data - Implementing cybersecurity in the Metaverse: Platform owners, Property owners/renters, Consumers/users **Metaverse and cybercrime**: Scam and theft- Rug pull- Money manipulation and wash trading-Money laundering		
UNIT-V	**Metaverse applications, challenges and open issues**	**9**
Metaverse applications: Gaming and entertainment- Travel and tourism - Education and learning-Real estate -Banking and Finance- Healthcare- Social media- Fashion **Metaverse challenges and open issues:** Persistency - Interoperability and scalability- Maturity-Regulation- Usefulness and ease-of-use - Privacy and data security- Content creation- NFTs and creator economy - Social, legal and ethical issues in the Metaverse		
	Contact Hours :	**45**

List of Experiments	
1	Create and customize an avatar in a Metaverse platform (Decentraland, Second Life, or Roblox).
2	Analyze different layers of the Metaverse (Experience, Discovery, Creator Economy, etc.).
3	Build a simple AR application using WebAR or Unity.

4	Create a simple NFT and understand its role in the Metaverse.
5	Measure motion sickness symptoms when using VR applications.
6	Design a simple 3D virtual space.
7	Identify phishing and scam techniques used in the Metaverse.
8	Create a virtual classroom using a Metaverse platform.
Tools: Mozilla Hubs, Spatial.io, Gather.town. Unity, Unreal Engine, culus Quest 2, VRChat, Unity VR.	

	Contact Hours:	**30**
	Total Contact Hours:	**60**

Course Outcomes:On completion of the course, the students will be able to
• Understand the characteristics, and interdisciplinary nature of the Metaverse, the opportunities and risks it presents.
• Analyze Metaverse layers, the technologies used in creating them, as well as design theories and practices for Metaverse.
• Examine and discuss Metaverse platforms, applications and the latest technological developments in this area
• Identify cybersecurity issues, understand cybercrime in the Metaverse
• Discuss various applications and the open challenges in Metaverse

Text Books:	
1	Terry Winters ,"The Metaverse : Prepare Now For the Next Big Thing! ", Independently published, 2021 (ISBN: 979-8450959283)

Reference Books:	
1.	Ball, M., 2022, "The Metaverse and How It Will Revolutionize Everything ", Liveright, ISBN: 978- 1324092032
2.	Christodoulou, K. Katelaris, L., Themistocleous, M, Christoudoulou P. and Iosif E, 2022, "NFTs and the Metaverse Revolution: Research Perspectives and Open Challenges", Blockchains and the Token Economy: Theory and Practice, Eds: Lacity M., Treiblmaier H., (2022), Palgrave Macmillan, Cham, pp. 139-178
3.	Damar, M. (2021). Metaverse shape of your life for future: A bibliometric snapshot. Journal of Metaverse, 1(1), 1–8.
4	Day, J. (2022) Metaverse will see cyberwarfare attacks unlike anything before: 'Massively elevated', February 28, https://www.express.co.uk/news/science/1570844/metaverse-news-cyberwarfare-attacks-virtual-worlds-russia-china-spt.
5	Davis, A., Khazanchi, D., Murphy, J., Zigurs Ilze, & Owens, D. (2009). Avatars, people, and virtual worlds: Foundations for research in metaverses. Journal of the Association for Information Systems, 10(2), 90–117. https://doi.org/10.17705/1jais.00183

Learning Activities and Teaching Methods:
• Faculty Lectures • Guest-Lectures Seminars • Directed and Background Reading • Case Study Analysis • Academic Paper Discussion • Simulations • Student-led Presentations • In-Class Exercises

Assessment Methods:
•Interactive Activities • Assignments / Project • Quiz • CAT & Final Exams

CO - PO – PSO matrices of course

PO/PSO CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CS23B31.1	3	2	2	2	3	3	2	3	-	2	-	3	3	2	3
CS23B31.2	3	3	3	3	3	2	2	2	-	2	-	3	3	3	3
CS23B31.3	3	3	3	3	3	2	2	2	-	2	-	3	3	3	3
CS23B31.4	3	3	3	3	3	3	2	3	-	3	-	3	3	3	3
CS23B31.5	3	3	3	3	3	2	2	2	3	3	2	3	3	3	3
Average	3	2.8	2.8	2.8	3	2.4	2	2.4	3	2.4	3	3	3	3	3

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3:Substantial (High) No correlation"-

Subject Code	Subject Name (Lab oriented Theory Courses)	Category	L	T	P	C
AI23A36	Big data Analytics	PC	3	0	2	4

Objectives:	
•	To understand the basic concepts of big data and Hadoop.
•	To have knowledge on accessing , storing and manipulating the huge data from different sources.
•	To implement Map-Reduce programs for processing big data.
•	To realize storage and processing of big data using MongoDB, Pig, Hive and Spark.
•	To analyze big data using machine learning techniques.

UNIT-I	Introduction To Big Data	9
Classification of data, Characteristics, Evolution and definition of Big data, What is Big data, Why Big data, Traditional Business Intelligence Vs Big Data,Typical data warehouse and Hadoop environment. **Big Data Analytics:** Classification of Analytics, Importance of Big Data Analytics, Technologies used in Big data Environments, Few Top Analytical Tools , NoSQL, Hadoop.		
UNIT-II	**Hadoop And Map Reduce**	**9**
Introduction to Hadoop: Introducing hadoop, Why hadoop, Why not RDBMS, RDBMS Vs Hadoop, History of Hadoop, Hadoop overview, Use case of Hadoop, HDFS (Hadoop Distributed File System),Processing data with Hadoop, Managing resources and applications with Hadoop YARN(Yet Another Resource Negotiator). **Introduction to Map Reduce Programming:** Introduction, Mapper, Reducer, Combiner, Partitioner, Searching, Sorting, Compression.		
UNIT-III	**MongoDB**	**9**
Introduction to MongoDB: What is MongoDB, Why MongoDB, Terms used in RDBMS and MongoDB, Data Types in MongoDB, MongoDB Query Language.		
UNIT-IV	**FUNDAMENTALS OF APACHE PIG, HIVE**	**9**
Introduction to Hive: What is Hive, Hive Architecture, Hive data types, Hive file formats, Hive Query Language (HQL), RC File implementation, User Defined Function (UDF). **Introduction to Pig:** What is Pig, Anatomy of Pig, Pig on Hadoop, Pig Philosophy, Use case for Pig, Pig Latin Overview, Data types in Pig, Running Pig, Execution Modes of Pig, HDFS Commands, Relational Operators, Eval Function, Complex Data Types, Piggy Bank, User Defined Function, Pig Vs Hive.		
UNIT-V	**Spark And Data Analysis**	**9**
Spark and Big Data Analytics: Spark, Introduction to Data Analysis with Spark. **Text, Web Content and Link Analytics:** Introduction, Text Mining, Web Mining, Web Content and Web Usage Analytics, Page Rank, Structure of Web and Analyzing a Web Graph		
	Contact Hours :	**45**

List of Experiments				
1.	Install Hadoop and Implement the following file management tasks in Hadoop: Adding files and directories Retrieving files Deleting files and directories. **Note:** A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities.			
2.	Develop a MapReduce program to implement Matrix MultiplicationSuggested Dataset: Iris Dataset			
3.	Develop a Map Reduce program that mines weather data and displays appropriate messages indicating the weather conditions of the day.			
4.	Develop a MapReduce program to find the tags associated with each movie by analyzing movie lens data.			
5.	Implement Functions: Count – Sort – Limit – Skip – Aggregate using MongoDB			
6.	Pig Latin scripts to sort, group, join, project, and filter the data			
7.	Use Hive to create, alter, and drop databases, tables, views, functions, and indexes.			
8.	Implement a word count program in Hadoop and Spark.			
9.	Use CDH (Cloudera Distribution for Hadoop) and HUE (Hadoop User Interface) to analyze data and generate reports for sample datase			
		Contact Hours	**:**	**30**
		Total Contact Hours	**:**	**75**

Course Outcomes: On completion of the course, the students will be able to	
	Identify and list various Big Data concepts, tools and applications.
	Develop programs using HADOOP framework.
	Learn the working principles of big data management using MongoDB
	Use Hadoop Cluster to deploy Map Reduce jobs, PIG,HIVE and Spark programs
	Analyze the given data set and identify deep insights from the data set.

Text Books:	
1	Seema Acharya and Subhashini Chellappan “Big data and Analytics” Wiley India Publishers, 2nd Edition, 2019.
2	Rajkamal and Preeti Saxena, “Big Data Analytics, Introduction to Hadoop, Spark and Machine Learning”, McGraw Hill Publication, 2019.
Reference Books:	
1	Tom White, “Hadoop: The Definitive Guide” 4th Edition, O’reilly Media, 2015.
2	Thomas Erl, Wajid Khattak, and Paul Buhler, Big Data Fundamentals: Concepts, Drivers & Techniques, Pearson India Education Service Pvt. Ltd., 1st Edition, 2016.
3	John D. Kelleher, Brian Mac Namee, Aoife D'Arcy -Fundamentals of Machine Learning for Predictive Data Analytics: Algorithms, Worked Examples, MIT Press 2020, 2nd Edition
4	Mohammed Guller, “Big Data Analytics with Spark”, Apress, 2015

Web Video Lectures (e-Resources):

1	https://www.kaggle.com/datasets/grouplens/movielens-20m-dataset
2	https://www.youtube.com/watch?v=bAyrObl7TYE&list=PLEiEAq2VkUUJqp1k-g5W1mo37urJQOdCZ

3	https://www.youtube.com/watch?v=VmO0QgPCbZY&list=PLEiEAq2VkUUJqp1kg5W1mo37urJQOdCZ&index=4
4	https://www.youtube.com/watch?v=GG-VRm6XnNk https://www.youtube.com/watch?v=JglO2Nv_92A

CO - PO – PSO Mapping

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO3
AI23A36.1	3	3	2	2	1	-	-	1	-	-	-	1	3	3	1
AI23A36.2	3	3	2	2	2	-	-	2	-	-	-	1	3	3	2
AI23531.3	3	3	3	2	2	-	-	2	-	-	-	1	3	3	1
AI23A36.4	3	3	3	2	3	1	1	2	1	1	-	1	3	3	3
AI23A36.5	3	3	3	2	3	1	1	2	1	1	-	1	3	3	3
Average	3	3	2.6	2	2.2	1	1	1.8	1	1	-	1	3	3	2

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

No correlation: "-"

Subject Code	Subject Name (Lab Oriented Theory Course)	Category	L	T	P	C
CD23B11	AESTHETICS AND ART	PE	3	0	0	3

Objectives:	
•	To encounter and learn the major philosophical theories of art and aesthetics offered during specific historicalperiods.
•	To study the classical, modern, and contemporary philosophical responses to questions and problems of aesthetics.
•	To understand the ways in which art affects life on a personal, cultural, social, and global level.
•	To learn several theories of what art is, including realism, expressionism, cognitivism, formalism, andpostmodernism.
•	To think reflectively and critically about artworks, developing philosophical virtues and employing skills that arecrucial.

UNIT-I	AESTHETICS	9
Introduction of Aesthetic-The Etymology and Evolution -Aesthetics s Philosophy of Beauty and Art, TheContemporary Approach, Philosophical Approaches to Aesthetics.		
UNIT-II	**ART**	9
Theories of art: Representation, expression, and formalism- Art as a form of communication and expression-Art and its societal implications.		
UNIT-III	**COMPARISON OF ARTS**	9
Fine Arts and Crafts(Similarities, Distinctions), Pure and Applied Arts, Comparisons of Fine Arts, Visual Arts(Architecture, Sculpture), Painting and Photography, Drama and Cinema.		
UNIT-IV	**ART AND SCIENCE**	9
Applied Sciences and Applied Arts, Philosophy as theoretical Knowledge and its Relation to Fine Arts.		
UNIT-V	**INDIAN AESTHETICS AND RASA**	9
Aesthetics as "SaundriyaShastra", Beauty and Art in Vedic and in other Literary Works, Understanding about Theory ofRasa, Natyashastra.		
	Total Contact Hours : 45	

Course Outcomes:
On completion of the course, the students will be able to

CO1	Learn different digital designing on a basic level to aid in easy illustration.
CO2	Understand image editing.
CO3	Develop competency in computer graphics to create their own art work and patterns.
CO4	Understand the relevance of design in relation to art and architecture.
CO5	Develop designs based on inspirations from art and architecture.

Textbooks	
1	Michel-Antoine Xhignesse, "Aesthetics: 50 Puzzles, Paradoxes, and Thought Experiments", Routledge, 1st Edition, 2023
2	Caroline van Eck and Edward Winters, "Dealing with the Visual: Art History, Aesthetics and Visual Culture", Ashgate Publishing, 1st Edition, 2022.

Reference Book(s)/ Web links :	
1	Jerry Palmer and Mo Dodson, "Design and Aesthetics: A Reader", Psychology Press, 1st Edition, 2023.
2	Mads Nygaard Folkmann, "The Aesthetics of Imagination in Design", MIT Press, 1st Edition, 2021.
3	James Clement Moffat, "An Introduction to the Study of Aesthetics", Moore, Wilstach, Keys & Co., 1st Edition, 2022.
4	John Heskett, "Design: A Very Short Introduction", Vol. 136, Oxford University Press, 1st Edition, 2020.
5	William Lidwell, Kritina Holden, and Jill Butler, "Universal Principles of Design", Rockport Pub, 3rd Edition, 2019.
6	https://www.gamedeveloper.com/
7	https://in.ign.com/
8	https://www.gameindustry.com/

CO – PO – PSO matrices of course

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CD23B11.1	-	1	2	2	2	3	1	1	1	2	1	3	0	0	3
CD23B11.2	0	1	2	2	2	3	1	1	1	2	1	3	0	0	3
CD23B11.3	0	1	2	2	2	3	1	3	1	2	1	3	0	0	3
CD23B11.4	0	1	2	2	2	3	1	1	1	2	1	3	0	0	3
CD23B11.5	0	1	2	2	3	3	1	1	1	2	1	3	0	0	3
Average	0	1	2	2	2.2	3	1	1.4	1	2	1	3	0	0	3

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation: "-"

Subject Code	Subject Name (LabOrientedTheoryCourse)	Category	L	T	P	C
CD23B12	**DIGITAL MEDIA ENTREPRENEURSHIP**	**PE**	**3**	**0**	**0**	**3**

Objectives:	
•	To introduce the possibilities of digital media entrepreneurship as an idea.
•	To study and comprehend the dynamics of establishing digital service firms and the factors associated with it.
•	To facilitate the students with client approaching and convincing skills, which can enable them to brandthemselves.
•	To comprehend the dynamics of the global and local digital markets, and their applicability to specified niches.
•	To introduce the possibilities of digital media entrepreneurship as an idea.

UNIT-I	**INTRODUCTION TO ENTREPRENEURSHIP**	9
Introduction to Entrepreneurship, Definitions and Types of entrepreneurs, Characteristics/traits associated with entrepreneurs, Entrepreneurial Environment and Motivation, Role of entrepreneurship in the developing society, Themedia entrepreneur		
UNIT-II	**INTRODUCTION TO MEDIA MANAGEMENT**	9
Different Schools of Management, Difference between Entrepreneurs and Managers, The Media Industry today andits emerging trends, The Indian entertainment and media business Concepts of strategic Media Management, Customer Relationship Management in Media Industries.		
UNIT-III	**INTRODUCTION TO MEDIA ECONOMICS**	9
Introduction to Media Economics, Basic concepts of Financial Management, Personnel management in MediaOrganizations, Issues in Audience Management, Digital Media Management,		
UNIT-IV	**INTRODUCTION TO CORPORATE SOCIAL RESPONSIBILITY**	9
Introduction to Corporate Social Responsibility, Convergence, Globalization and Media Management		
UNIT-V	**MEDIA EVENT MANAGEMENT**	9
Identifying core concepts behind the event, Strategic planning, Group Sustainability, Introduction to ResourceMobilization, Event Marketing, Event documentation and evaluation		
	Total Contact Hours : 45	

Course Outcomes: On completion of the course, the students will be able to	
CO1	Understand the definitions, types, and traits of entrepreneurs and evaluate the significance of entrepreneurship in societal and media contexts.
CO2	Analyse the differences between entrepreneurial and managerial roles, and apply media management principles to address emerging trends in the media industry.
CO3	Demonstrate knowledge of media economics, financial management, and audience engagement, particularly in the context of digital media.
CO4	Assess the role of CSR in media management and evaluate the impacts of globalization and convergence on media organizations.

CO5	Plan, market, and evaluate media events by applying strategic planning, resource mobilization, and event documentation techniques.

Text Book(s):	
1.	Michelle Ferrier & Elizabeth Mays, "The Digital Journalism Handbook", Rebus Community, '1st Edition, 2020
2.	Penelope M. Abernathy, "The News Gap: When the Information Preferences of the Media and the Public Diverge", John Wiley & Sons, 1st Edition, 2021

Reference Books(s)	
1.	Penelope M. Abernathy and JoAnn Sciarrino, "The Strategic Digital Media Entrepreneur", John Wiley & Sons, 1st Edition, 2020.
2.	Mohammad Keyhani, Tobias Kollmann, and Alina Sorgner (Eds.), "Handbook of Digital Entrepreneurship", Edward Elgar Publishing, 1st Edition, 2022.

CO - PO – PSO matrices of course

PO/PSO CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CD23B12.1	3	1	3	2	3	3	3	2	3	3	2	3	3	2	3
CD23B12.2	3	1	3	2	3	3	3	2	3	3	2	3	3	2	3
CD23B12.3	3	1	3	2	3	3	3	2	3	3	2	3	3	2	3
CD23B12.4	3	1	3	2	3	3	3	2	3	3	2	3	3	2	3
CD23B12.5	3	1	3	2	3	3	3	2	3	3	2	3	3	2	3
Average Mapping	**3**	1	**3**	2	**3**	**3**	**3**	2	**3**	**3**	2	**3**	**3**	2	**3**

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation: "-"

Subject Code	Subject Name(Theory Course)	Category	L	T	P	C
CD23B13	INTERACTIVE MARKETING FUNDAMENTALS	PE	3	0	0	3

Objectives:	
●	To understand the fundamentals of interactive marketing and its applications.
●	To develop skills in using various interactive marketing tools.
●	To create engaging marketing strategies to capture audience attention.
●	To analyse the impact of interactive marketing on business growth.
●	To understand the ethical challenges in interactive marketing.

Unit – I	FUNDAMENTALS OF INTERACTIVE MARKETING	9
Introduction to Interactive Marketing: Definition, types, and role in digital environments - Differences between Traditional and Interactive Marketing: Key differences and advantages - Customer Engagement Strategies: How interactivity improves customer retention - Overview of Digital Platforms: Websites, social media, and mobile apps as interaction spaces.		
UNIT-II	**INTERACTIVE TOOLS AND TECHNIQUES**	9
Types of Interactive Content: Contests, quizzes, polls, and calculators - Creating Engaging Quizzes: How to design quizzes to capture customer data - Polls and Surveys: Engaging audiences and collecting data - Interactive Calculators: Tools to solve customer problems (e.g., cost estimators).		
UNIT-III	**VISUAL AND INTERACTIVE CONTENT**	9
Interactive Videos: Designing personalized video experiences - Gamification: Using game mechanics in marketing to increase engagement - Interactive Infographics: Creating visually appealing content that includes animated elements - Augmented Reality (AR) in Marketing: Using AR to provide interactive experiences.		
UNIT-IV	**SOCIAL MEDIA AND INFLUENCE MARKETING**	9
Leveraging Social Media: Strategies for creating brand conversations-Influence Marketing: How to engage influencers to promote your brand-Building Loyalty through Social Media: Engaging customers through interactive content-Measuring Social Media Success: Tracking metrics like engagement and conversions.		
UNIT-V	**ETHICS, REGULATIONS, AND ANALYTICS IN INTERACTIVE MARKETING**	9
Ethical Considerations: Understanding the ethical challenges of interactive marketing-Regulatory Guidelines: Data protection laws (GDPR, CCPA) and their impact on marketing strategies-Analytics in Interactive Marketing: Tools and methods for measuring success-Adapting to Trends: Staying updated with emerging trends like AI, voice search, and AR.		
	Total Contact Hours : 45	

Course Outcomes: On completion of the course, the students will be able to	
CO1	Understand and apply interactive marketing fundamentals.
CO2	Design and implement interactive tools such as quizzes, polls, and calculators.
CO3	Create and assess engaging content through videos, infographics, and gamification.
CO4	Develop social media strategies that involve influencer collaboration and audience engagement.
CO5	Evaluate ethical and regulatory challenges in interactive marketing campaigns.

Text Book(s):	
1	Dhruva Grewal, Michael Levy, "Marketing", McGraw-Hill Education, 1st Edition, 2024.
2	Jeff Larson, Stuart Draper, "Digital Marketing Essentials", Pearson, 1st Edition, 2023.
3	Claus Wilke, "Fundamentals of Data Visualization: A Primer on Making Informative and Compelling Figures", O'Reilly Media, 2nd Edition, 2023.
4	Scott Murray, "Interactive Data Visualization for the Web", O'Reilly Media, 2nd Edition, 2023.

Reference Books(s) :	
1	Sanjay Sharma, Data Privacy and GDPR Handbook, Wiley, 1st Edition, 2019.
2	Brittany Hennessy, Influencer: Building Your Personal Brand in the Age of Social Media, Citadel Press, 1st Edition, 2018.
3	Gabe Zichermann, Joselin Linder, Gamification in Marketing, Wiley, 1st Edition, 2010.
4	Type form - Interactive Quizzes and Polls : https://www.typeform.com/

CO - PO – PSO MAPPING

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	2	–	3	–	–	2	3	2	–	–	2	2	–
CO2	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	2	3	3	3	3	2	3	3	3	3
CO4	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3
Average	3	2.8	2.8	3	3	2	3	2.8	3	2.8	2.75	2.8	2. 6	2.8	3

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation: "-"

Subject Code	Subject Name (LabOrientedTheoryCourse)	Category	L	T	P	C
CD23B31	DIGITAL AUDIO AND DESIGN SYNTHESIS	PC	2	0	2	3

Objectives:	
•	To impart the concepts of simplifying Boolean expression using K-map techniques and Quine-McCluskey minimization techniques
•	To impart the concepts of designing and analysing combinational logic circuits.
•	To impart design methods and analysis of sequential logic circuits.
•	To impart the concepts of Verilog HDL-data flow and behavioural models for the design of digital systems.
•	Apply sound design in multimedia, gaming, and virtual environments.

UNIT-I	INTRODUCTION TO DIGITAL AUDIO AND SOUND DESIGN	6
Overview of sound: Frequency, amplitude, and waveform.-Analog vs. Digital sound: Sampling, quantization, and bit depth-Audio file formats: WAV, MP3, AIFF, FLAC-Introduction to Sound Design-The role of sound design in music production, film, and games-The creative process in sound design		
UNIT-II	**AUDIO SYNTHESIS AND SOUND CREATION**	6
Principles of Sound Synthesis-Types of sound synthesis: Subtractive, additive, FM (Frequency Modulation), and wavetable synthesis-Key parameters in synthesis: Oscillators, filters, envelopes, LFOs (Low Frequency Oscillators).		
UNIT-III	**DIGITAL AUDIO WORKSTATIONS (DAWS) AND WORKFLOW**	**6**
Introduction to popular DAWs: Ableton Live, Logic Pro, Pro Tools, FL Studio- Understanding the interface and basic functions: Track arrangement, mixing, automation-Signal routing, effects, and buses in DAWs Using DAWs for Sound Design		
UNIT-IV	**SYNTHESIS TOOLS AND TECHNIQUES**	**6**
Introduction to virtual synthesizers: Serum, Massive, Sylenth1.-Using plugins for effects: Reverb, delay, EQ, distortion-The role of modulation in sound design.-Sampling and Sound Libraries-The process of sampling and its use in sound design		
UNIT-V	**AUDIO PROCESSING AND EFFECTS**	**6**
Audio Processing Techniques-Time-based effects: Reverb, delay, chorus, and flange-Dynamic effects: Compression, limiting, gating, and expansion-Equalization: Frequency shaping and tonal balancing.		
	Total Contact Hours : 30	

List of Experiments	Total Contact Hours : 30
1	Create Encode and decode audio files into different formats (WAV, MP3, AIFF, and FLAC) and compare their quality and file size.
2	Create a project with multiple layers of sounds, grouping tracks for better organization and mix control.
3	Combine multiple synths or layers to create a rich, textured soundscape.
4	Create a dynamic sound using FM synthesis by modulating one oscillator with another.
5	Create a simple project and apply mixing techniques using EQ, panning, and volume automation.
6	Apply reverb, delay, distortion, and EQ plugins to a sound and analyze the creative outcomes.
	Mini Project: Create sound effects for a specific scene or level of a video game.

Course Outcomes: On completion of the course, the students will be able to	
CO1	Understand fundamental concepts of sound and digital audio, including file formats and the role of sound design in various media.
CO2	Apply principles of sound synthesis and key parameters to create and manipulate audio.
CO3	Utilize DAWs for track arrangement, mixing, automation, and sound design workflows.
CO4	Use virtual synthesizers, plugins, and sampling techniques to design creative audio.
CO5	Implement audio processing and effects to shape and enhance soundscapes.

Textbooks:	
1	Richard James Burgess,"The Art of Sound Design: Creating the Sound for Film and TV", Routledge,2nd Edition,2021.
2	David Sonnenschein, "Sound Design: The Expressive Power of Music, Voice, and Sound Effects in Cinema", Focal Press,3rd Edition,2020.
Reference Books:	
1	Curtis Roads, "The Computer Music Tutorial", MIT Press, 2nd Edition,2021.
2	Mike Senior ,"Mixing Secrets for the Small Studio", Focal Press,3rd Edition,2020

CO - PO – PSO matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CD23B31	3	3	3	2	3	2	3	3	3	2	3	3	2	3	2
CD23B31	3	3	3	2	3	2	3	3	3	2	3	3	2	3	2
CD23B31	3	3	3	2	3	2	3	3	3	2	3	3	2	3	2
CD23B31	3	3	3	2	3	2	3	3	3	2	3	3	2	3	2
CD23B31	3	3	3	2	3	2	3	3	3	2	3	3	2	3	2
Average Mapping	**3**	**3**	**3**	2	**3**	2	**3**	**3**	**3**	2	**3**	**3**	2	**3**	2

correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation: "-"

Subject Code	Subject Name (Lab Oriented Theory Course)	Category	L	T	P	C
CD23B32	DESIGN DIGITAL ADVERTISING	PE	2	0	2	3

Objectives:	
•	To understand the basics of advertising
•	To identify and compare advertising media and channels
•	To develop effective advertising strategies
•	To apply creative design principles
•	To analyse ethics and effectiveness in advertising

UNIT-I	**FUNDAMENTALS OF ADVERTISING**	6
Definition, history, and evolution of advertising-Role of advertising in society and the economy-Key advertising terms and concepts-Types of advertising: commercial, institutional, corporate, public service, etc.		
UNIT-II	**ADVERTISING MEDIA AND CHANNELS**	6
Traditional media: Print (newspapers, magazines), Broadcast (TV, radio), Outdoor, Transit-Digital media: Social media, search engine ads, display ads, video ads-Emerging trends: Mobile advertising, influencer marketing, content marketing.		
UNIT-III	**ADVERTISING STRATEGY AND CAMPAIGN DEVELOPMENT**	6
Market research and consumer behaviour analysis-Setting advertising objectives (awareness, consideration, conversion)-Developing a creative brief and campaign structure-Target audience segmentation and message tailoring.		
UNIT-IV	**CREATIVE DESIGN AND EXECUTION**	6
Design elements: colour, typography, images, layout-Copywriting: headlines, slogans, body text-Ad formats: print, digital, video, radio-Ad production basics: working with designers, videographers, and media planners.		
UNIT-V	**ETHICS, REGULATION, AND MEASURING ADVERTISING EFFECTIVENESS**	6
Ethics in advertising: Truthfulness, manipulation, targeting vulnerable populations-Legal and regulatory frameworks: FTC regulations, ASA, and other advertising bodies-Measuring effectiveness.		
	Total Contact Hours : 30	

List of Experiments	Total Contact Hours : 60
1	Create and a timeline research of major advertising milestones.
2	Create a mock social media or display ad for a product.
3	Design a billboard or transit advertisement.
4	Develop a creative brief for an advertising campaign.
5	Create a print ad layout using design elements.
6	Develop a storyboard or script for a video advertisement.
	Mini project: Design a series of digital banner ads for a fictional product or service. The goal is to apply principles of graphic design, typography, and animation to create effective and engaging advertisements.

Course Outcomes: On completion of the course, the students will be able to	
CO1	Understanding the evolution, concepts, and societal impact of advertising.
CO2	Distinguish between traditional, digital, and emerging advertising media.
CO3	Develop effective advertising strategies and targeted campaigns.
CO4	Create engaging advertisements using design and copywriting principles.
CO5	Evaluate advertising ethics, regulations, and effectiveness metrics.

Text Books(s):	
1	Ryan Deiss, Russ Henneberry, "Digital Marketing for Dummies", Wiley, 3rd Edition, 2021.
2	Jeff Larson, Stuart Draper, "Digital Marketing Essentials", Pearson, 3rd Edition, 2021.

Reference Book(s) :	
1	K. A. C. Forney, B. L. Hall, "Digital Advertising: Concepts and Strategies", McGraw-Hill Education, 1st Edition, 2021.
2	Kenneth Clow, Donald Baack,"Principles of Advertising", Pearson, 7th Edition, 2021.

CO - PO – PSO matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CD23B32.1	1	2	2	2	3	3	1	2	2	3	1	2	2	3	3
CD23B32.2	1	2	2	2	3	3	1	2	2	3	1	2	2	3	3
CD23B32.3	1	2	2	2	3	3	1	2	2	3	1	2	2	3	3
CD23B32.4	1	2	2	2	3	3	1	2	2	3	1	2	2	3	3
CD23B32.5	1	2	2	3	3	3	1	2	2	3	1	2	2	3	3
Average Mapping	1	2	2	2.2	**3**	**3**	1	2	2	**3**	1	2	2	**3**	**3**

Correlation levels 1, 2 or 3 are as defined below:
1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation: "-"

Subject Code	Subject Name (Lab Oriented Theory Course)	Category	L	T	P	C
IT23B31	**C# and .NET Programming** (Common to IT, AIML, AIDS, CSE, CSBS, CSE CS)	PE	2	0	2	3

Objectives:	
•	To learn basic programming in C# and the object oriented programming concepts.
•	To study the advance programming concepts in C#.
•	To understand the working of base class libraries, their operations and manipulation of data using XML.
•	To update and enhance skills in writing Windows application, WPF, WCF and WWF with C# and .NET.
•	To implement mobile applications using .Net compact framework.

UNIT-I	**C# LANGUAGE BASICS**	
.Net Architecture – Core C#– Objects and Types- – Inheritance- Generics – Arrays and Tuples – Operators and Casts.		
UNIT-II	**C# ADVANCED FEATURES**	
Delegates – Lambdas – Events– Strings and Regular Expressions – Collections –Asynchronous Programming- Memory Management and Pointers – Errors and Exceptions – Reflection.		
UNIT-III	**BASE CLASS LIBRARIES AND DATA MANIPULATION**	
Diagnostics -Tasks, Threads and Synchronization – Manipulating XML–ADO.NET- Peer-to-Peer Networking –Core Windows Presentation Foundation (WPF).		
UNIT-IV	**WINDOW BASED APPLICATIONS, WCF AND WWF**	
Core ASP.NET- ASP.NET Web forms -Windows Communication Foundation (WCF)– Introduction to Web Services –.Net Remoting -Windows Service – Windows Workflow Foundation (WWF)		
UNIT-V	**.NET FRAMEWORK AND COMPACT FRAMEWORK**	
Assemblies – Custom Hosting with CLR Objects – Core XAML – .Net Compact Framework – Compact Edition Data Stores – Errors, Testing and Debugging – Optimizing performance .		
	Contact Hours: 30	

List of Experiments	
1	Write a console application that obtains four int values from the user and displays the product. Hint: you may recall that the Convert.ToDouble() command was used to convert the input from the console to a double; the equivalent command to convert from a string to an int is Convert.ToInt32().
2	Write an application that receives the following information from a set of students: Student Id: Student Name: Course Name: Date of Birth: The application should also display the information of all the students once the data is Entered. Implement this using an Array of Structures.

3	Write a program to declare a class “staff” having data members as name and post. Accept this data 5 for 5 staffs and display names of staff who are HOD.
4	Write a program to implement multilevel inheritance from following figure. Accept and display data for one student.

5	Write a program to create a delegate called TrafficDel and a class called TrafficSignal with the following delegate methods.
	Public static void Yellow(){
	Console.WriteLine(“Yellow Light Signal To Get Ready”);
	}
	Public static void Green(){
	Console.WriteLine(“Green Light Signal To Go”);
	}
	Public static void Red(){
	Console.WriteLine(“Red Light Signal To Stop”);
	}
	Also include a method IdentifySignal() to initialize an array of delegate with the above methods and a method show() to invoke members of the above array.

6	Write a program to accept a number from the user and throw an exception if the number is not an even number.
7	Create an application that allows the user to enter a number in the textbox named “getnum”. Check whether the number in the textbox “getnum” is palindrome or not. Print the message accordingly in the label control named lbldisplay when the user clicks on the button “check”.
8	Create a project that calculates the total of fat, carbohydrate and protein. Allow the user to enter into text boxes. The grams of fat, grams of carbohydrate and grams of protein. Each gram of fat is 9 calories and protein or carbohydrate is 4 calories. Display the total calories of the current food item in a label. Use to other labels to display and accumulated some of calories and the count of items entered. The form food have 3 text boxes for the user to enter the grams for each category include label next to each text box indicating what the user is enter.
9	Database programs with ASP.NET and ADO.NET. Create a Web App to display all the Empname and Deptid of the employee from the database using SQL source control and bind it to GridView . Database fields are(DeptId, DeptName, EmpName, Salary).
10	Programs using ASP.NET Server controls. Create the application that accepts name, password, age, email id, and user id. All the information entry is compulsory. Password should be reconfirmed. Age should be within 21 to 30. Email id should be valid. User id should have at least a capital letter and digit as well as length should be between 7 and 20 characters.

	Contact Hours	**:**	**30**
	Total Contact Hours	**:**	**60**

Course Outcomes:

On completion of the course, the students will be able to

- Write various applications using C# Language.
- Write various applications using advanced C# concepts.
- Create window services, libraries and manipulating data using XML.
- Develop distributed applications using .NET Framework.
- Create mobile applications using .NET compact Framework.

Text Books(s)

1. Christian Nagel, Bill Evjen, Jay Glynn, Karli Watson, Morgan Skinner, "Professional C# 2012 and .NET 4", Wiley, 2012.
2. Andy Wigley, Daniel Moth, Peter Foot, "Mobile Development Handbook", Microsoft Press, 2007.

Reference Books

1. Ian Gariffiths, Mathew Adams, Jesse Liberty, "Programming C# 4.0‖:,OReilly, Fourth Edition, 2010.
2. D Andrew Troelsen, "Pro C# 5.0 and the .NET 4.5 Framework", Apress publication, 2012.

CO-PO-PSO Mapping

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT23B31.1	2	2	1	1	1	-	-	-	1	-	-	1	2	1	-
IT23B31.2	2	2	1	2	1	-	-	-	1	-	2	2	2	2	-
IT23B31.3	2	2	2	1	1	-	-	-	1	-	-	1	2	1	-
IT23B31.4	2	2	2	2	2	-	-	-	2	-	2	2	2	2	2
IT23B31.5	3	2	2	2	3	-	-	-	3	-	2	2	2	2	2
Average	**2.2**	**2.0**	**1.6**	**1.6**	**1.6**	**-**	**-**	**-**	**1.6**	**-**	**2.0**	**1.6**	**2.0**	**1.6**	**2.0**

Correlation levels 1, 2 or 3 are as defined below: 1: Slight (Low) 2: Moderate (Medium)

3: Substantial (High) No correlation: "-"

Subject Code	Subject Name	Category	L	T	P	C
CD23A31	INTRODUCTION TO MOTION GRAPHICS	PE	2	0	4	4

Objectives:	
•	To understand the history, evolution, and significance of motion graphics and visual effects in modern media.
•	To learn and apply the basic principles of animation, including squash and stretch, anticipation, and staging.
•	To explore colour theory, typography, and layout principles for effective motion graphics design.
•	To create simple animations using basic tools and techniques.
•	To practice storyboarding techniques for visualization and project planning.

UNIT – I	**INTRODUCTION**	**6**
History, evolution, and key applications of motion graphics – visual Effects - Definition, scope, and importance in modern media		
UNIT – II	**PRINCIPLES OF ANIMATION**	**6**
Animation principles- Squash and stretch, anticipation, staging - Timing and Spacing - Understanding rhythm, flow, and fluidity in animation		
UNIT –III	**DESIGN AND COMPOSITION**	**6**
Color theory, typography, and layout principles - Storyboarding techniques, visualization, and planning.		
UNIT –IV	**PRACTICAL MOTION GRAPHICS CREATION**	**6**
Basic tools and features of Adobe After Effects and Blender - Creating a simple animation using learned tools and techniques		
UNIT – V	**ADVANCED TECHNIQUES AND TRENDS**	**6**
Using expressions, 3D layers, and plugins - Contemporary styles, techniques, and future directions -		
	Total Contact Hours : 30	

List of Experiments	Total Contact Hours : 60
1	Create a timeline highlighting key milestones and breakthroughs in motion graphics.
2	Create a short animation focusing on rhythmic movement and fluid transitions.

3	Create a motion graphic sequence using complementary and analogous colour schemes.
4	Create simple animations demonstrating each principle using Adobe After Effects or Blender.
5	Design and animate a short project, such as a moving logo or simple character animation.
6	Create a storyboard for a simple animation, including key frames and notes on movement.
7	Create animations using basic expressions like wiggle or time-based effects in After Effects.
	Mini project: Create an engaging animated text sequence for a fictional movie or brand

Course Outcomes: On completion of the course, the students will be able to	
CO1	Understand the history, evolution, and applications of motion graphics and visual effects in modern media.
CO2	Apply core animation principles like squash and stretch, anticipation, timing, and spacing to achieve rhythm and fluidity in motion graphics.
CO3	Utilize colour theory, typography, layout principles, and storyboarding techniques to plan and design motion graphics projects.
CO4	Demonstrate proficiency with tools like Adobe After Effects and Blender to create basic motion graphics and animations.
CO5	Explore advanced features such as expressions, 3D layers, and plugins while analyzing contemporary styles and future trends in motion graphics.

Text Book(s):	
1	Chris and Trish Meyer, "Creating Motion Graphics with After Effects**",** Wiley, 3rd Edition, 2021.
2	Chris Jackson, "Motion Design Toolkit**",** Cengage Learning, 1st Edition, 2021.
3	William J. McCauley, "Introduction to Motion Graphics", Routledge, 1st Edition, 2022.
Reference Book(s) /Web links:	
1.	https://www.youtube.com/watch?v=RmH4gKSBJ5Y
2.	https://www.youtube.com/watch?v=ROw_Xnmg2W4
3,	https://www.youtube.com/watch?v=5tQ0hf2SCeo

CO - PO – PSO matrices of course

PO/PSO CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**	**PSO 3**
CD23C31.1	-	1	2	2	2	3	1	1	1	2	1	3	0	0	3
CD23C31.2	0	1	2	2	2	3	1	1	1	2	1	3	0	0	3
CD23C31.3	0	1	2	2	2	3	1	3	1	2	1	3	0	0	3
CD23C31.4	0	1	2	2	2	3	1	1	1	2	1	3	0	0	3
CD23C31.5	0	1	2	2	3	3	1	1	1	2	1	3	0	0	3
Average Mapping	0	1	2	2	2.2	3	1	1.4	1	2	1	3	0	0	3

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation:

Subject Code	Subject Name(Laboratory Course)	Category	L	T	P	C
CD23C32	DATA VISUALIZATION	PC	3	0	2	4

Objectives:	
●	To introduce students to Excel's basic and advanced data visualization techniques.
●	To familiarize students with Tableau.
●	To develop skills in using Power BI.
●	To enable students to design comprehensive visual dashboards.
●	To apply knowledge through a capstone project.

List of Experiments	
Excel for Data Visualization	
1	**Data Manipulation and Cleaning** • Using Functions and formulae for Data Cleaning. • Sorting, Filtering and Data Validation techniques.
2	**Excel Charts and Tools** • Getting started with charts (Bar, Line, Pie). • Advanced charts (Histograms, Box plots, Area Chart, Bubble chart).
3	**Excel Advanced Features** • Using PivotTables for data analysis. • Dynamic Dashboards with Slicers and Timeline.
Data Visualization with Tableau	
4	**Getting Started with Tableau** • Connecting to data and basic visualizations. • Interactive Dashboards and Storytelling. • Filters, Pages, Hierarchies, Sorting and Dates.
5	**Advanced Data Manipulation Techniques** • Calculated fields and parameters. • Calculations and Expressions -Total and Aggregations, Automatic and Custom split. • Organizing Data and Visual Analytics – Reference lines and bands, Clusters, Forecasting, Trend lines, Summary Card.
Data Visualization with Power BI	
6	**Introduction to Power BI** • Getting started with Data importing and transforming with Power Query. • Report designing with basic visualizations and using the visualization pane. • Measures, Filters. • Features of Power BI- Drill through, Hierarchies.

7	**Advanced Power BI** • DAX. • Creating complex reports and dashboards.		
8	**Capstone Project -** Students will select a real-world dataset and use any tools (Excel, Tableau, and Power BI) to create comprehensive dashboards.		
	Total Contact Hours	**:90**	**90**

Course Outcomes:	
On completion of course you will be able to	
CO1	Create basic and advanced visualizations in Excel for data analysis.
CO2	Develop interactive dashboards and perform data manipulations in Tableau.
CO3	Design reports and apply DAX for advanced reporting in Power BI.
CO4	Integrate and organize data to create comprehensive dashboards using various visualization tools.
CO5	Apply their learning to solve real-world data visualization problems using Excel, Tableau, and Power BI.

Textbooks:	
1	Kieran Healy, "Data Visualization: A Practical Introduction", Princeton University Press, 1st Edition, 2022.
2	Claus Wilke, "Fundamentals of Data Visualization: A Primer on Making Informative and Compelling Figures", O'Reilly Media, 2nd Edition, 2023.
3	Jon Schwabish, Better Data Visualizations: A Guide for Scholars, Researchers, and Wonks", Columbia University Press, 1st Edition, 2023.
4	Sanjeev J. Wagh, Manisha S. Bhende, Anuradha D. Thakare, "Fundamentals of Data Science", CRC Press, 2nd ,2022.
Reference Books (s):	
1.	Excel Visualizations Power BI Documentation
2.	https://learn.microsoft.com/en-us/training/browse/?products=power-bi https://www.tableau.com/learn/training
3.	Online Course: Coursera — Data Visualization with Tableau Excel Visualizations
4.	Power BI Documentation

CO - PO – PSO matrices of course

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CD23C32.1	3	2	2	1	2	-	-	-	-	-	-	-	3	2	1
CD23C32.2	3	3	2	2	3	1	-	-	-	-	-	-	3	3	2
CD23C32.3	3	2	3	2	3	-	1	-	-	-	-	-	3	3	2
CD23C32.4	3	3	3	2	3	-	1	1	-	-	-	-	3	3	3
CD23C32.5	3	3	3	3	3	2	2	1	1	1	2	1	3	3	3

correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation: "-"

Subject Code	Subject Name (Lab Oriented Theory Course)	Category	L	T	P	C
CD23C33	HADOOP AND BIG DATA ANALYTICS	PE	1	0	6	4

Objectives:	
●	To understand Big Data and Hadoop**:** Learn Big Data types, their importance, and the basics of Apache Hadoop.
●	To master HDFS and data flow**:** Study HDFS design, command-line usage, and data ingestion.
●	To learn Map Reduce concepts**:** Understand Map Reduce job execution, scheduling, and data shuffling.
●	To explore Hadoop ecosystem tools**:** Get familiar with Pig, Hive, HBase, and Big SQL for data processing.
●	To apply data analytics and machine learning**:** Use R and BigR for data analysis and machine learning techniques.

UNIT – I	INTRODUCTION TO BIG DATA AND HADOOP	3
Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, Analysing Data with Unix tools, Analysing Data with Hadoop, Hadoop Streaming, Hadoop Echo System		
UNIT – II	**HDFS(Hadoop Distributed File System)**	**3**
The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives, Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures.		
UNIT –III	**Map Reduce**	**3**
Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features.		
UNIT –IV	**Hadoop Eco System**	**3**
Pig: Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions		
UNIT – V	**Data Analytics with R**	**3**
Machine Learning: Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering. Big Data Analytics with BigR.		
	Total Contact Hours : 15	

List of Experiments	Total Contact Hours :90
1	State the main goal of the experiment (e.g., to practice basic data analysis and file manipulation using Unix commands).
2	Learn basic HDFS operations using the command-line interface.
3	Implement and execute a basic MapReduce job (e.g., word count).
4	Write and execute Pig scripts for data transformation.
5	Use Hive to create tables, load data, and run queries.
6	Set up HBase and perform basic CRUD operations.
7	Run basic SQL queries using Big SQL for data analysis.
8	Perform basic data analysis and visualization using R.
	Mini project: Analyse movie ratings data to find out which genres or movies are the most popular.

Course Outcomes: On completion of the course students will be able to:	
CO1	Identify Big Data and its Business Implications.
CO2	List the components of Hadoop and Hadoop Eco-System
CO3	Access and Process Data on Distributed File System
CO4	Manage Job Execution in Hadoop Environment and Analyze Infosphere BigInsights Big Data Recommendations.
CO5	Develop Big Data Solutions using Hadoop Eco System and Apply Machine Learning Techniques using R.

Reference Book(s):	
1	O'Reilly Media, "Data Science for Business" by Foster Provost and Tom Fawcett", O'Reilly Media, 2nd Edition, November 2020
2	Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow", O'Reilly Media, 2nd Edition, 2019.

Text Book(s):	
1	Holden Karau, Andy Konwinski, Patrick Wendell, Matei Zaharia, "Learning Spark: Lightning-Fast Data Analytics", O'Reilly Media, 2nd Edition, 2020.
2	Deepak Vohra, "Practical Hadoop Ecosystem: A Definitive Guide to Hadoop-Related Frameworks and Tools", Apress, 3rd Edition, 2020.

CO - PO – PSO matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CD23C33.1	1	2	2	2	3	3	1	2	2	3	1	2	2	3	3
CD23C33.2	1	2	2	2	3	3	1	2	2	3	1	2	2	3	3
CD23C33.3	1	2	2	2	3	3	1	2	2	3	1	2	2	3	3
CD23C33.4	1	2	2	2	3	3	1	2	2	3	1	2	2	3	3
CD23C33.5	1	2	2	3	3	3	1	2	2	3	1	2	2	3	3
Average Mapping	1	2	2	2.2	**3**	**3**	1	2	2	**3**	1	2	2	**3**	**3**

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation: "-"